WarmTouch®
Patient Warming System

Model WT-5300

Patient Warming System
Service Manual

To obtain information about a warranty, if any, contact Nellcor’s Customer Services Department (1.800.635.5267), or your local Nellcor representative.

Contents

Contents i
Figures iii
Tables vi
Safety Information 1
Warnings 1
Cautions 2
Introduction 3
Intended Use 3
Manual Availability 3
Background Information 3
Safety Features 4
Customized Warming Therapy 4
Automatic Temperature Stepdown 4
Automatic Over Temperature Shutdown 4
Warning Light 4
HEPA Filter 4
Wheel Locks 5
Symbols 6
Description of the Warming System 7
Routine Maintenance 9
HEPA Filter Replacement 9
Hose Replacement 11
Power Cord Replacement 13
Nozzle Replacement 15
Cleaning the Warming System 15
Performance Verification 17
Thermostat Protection Check 17
Output Temperature Check 20
Safety Tests 22
Disassembly Guide 23
Filter Cover Assembly Replacement 23
Separating the Warming Unit Front and Rear Covers 25
Front Cover Assembly Replacement 28
Universal PCB Replacement 37
Heater Assembly Replacement 45
Duct Adapter Assembly Replacement 61
Rear Cover Assembly Replacement 65
Spare Parts and Accessories 83
Ordering Information 83
WarmTouch Replacement Parts and Accessories 85
Manual Availability 85
Packing for Shipment 87
Introduction 87

Returning the WT-5300 87
General Instructions 87
Repacking in Original Carton 87
Repacking in a Different Carton 89

Specifications 91

Warming System Specifications 91
Transport and Shipping in Shipping Container 92
Ground Integrity Test 92
Earth Leakage Current Test 92
Enclosure Leakage Current Test 92

Principles of Operation 93

Control Panel 93
Main Circuit Board 94
DC Power Supply Circuit 94
Control Logic Circuit 95
Automatic Temperature Stepdown 95
Temperature Control Circuit 96
LCD Hour Meter 96
AC Power Section 96
Blower 97
Heater 97
Thermostat Protection 97
Over-Temperature Test Port 97

Index 101

Figures

Figure 1: Cart Wheel Lock 5
Figure 2: Model WT-5300 Front View 7
Figure 3: Model WT-5300 Back View 8
Figure 4: Operating Hours Meter 9
Figure 5: Rear Panel Screws 10
Figure 6: HEPA Filter 11
Figure 7: Back of Case 12
Figure 8: Hose Retaining Wire 13
Figure 9: Power Cord Routing 14
Figure 10: Over-Temperature Test Port 18
Figure 11: WarmTouch Boost Temperature Setting 19
Figure 12: Warning Light 19
Figure 13: Output Temperature Setup 21
Figure 14: Temperature Selection 21
Figure 15: Ground Stud 22
Figure 16: Power Cord 24
Figure 17: Rear Panel Screws 24
Figure 18: Power Cord 25
Figure 19: Power cord Removal 26
Figure 20: Cover Screw Locations 27
Figure 21: Separated Covers 27
Figure 22: Cable Harness Cable Ties-downs 29
Figure 23: Front Cover Assembly 29
Figure 24: Power Switch Removal 30
Figure 25: Cable Disconnect 30
Figure 26: Universal PCB Screws 31
Figure 27: Universal PCB Lights 32
Figure 28: Universal PCB Screws 32
Figure 29: Cable Connections 33
Figure 30: Power Switch Clips 33
Figure 31: Front cover Assembly Component Locations 34
Figure 32: Equipotential Ground 35
Figure 33: Cable Harness Cable Ties-downs 35
Figure 34: Cover Screw Locations 36
Figure 35: Power Cord Retaining Bracket 37
Figure 36: Universal PCB Connections 38
Figure 37: Universal PCB Screws 39
Figure 38: Universal PCB Solid State Relay Assembly 39
Figure 39: Part of Universal PCB 40
Figure 40: Universal PCB Alarm Jumper 41
Figure 41: Universal PCB Lights 41
Figure 42: Universal PCB Screws 42
Figure 43: Cable Connections 42
Figure 44: Cable Harness Cable Ties-downs 43
Figure 45: Cover Screw Locations 44

Figure 46: Power Cord Retaining Bracket 45
Figure 47: Filter Removal 46
Figure 48: Blower Assembly Screws 47
Figure 49: Cable Harness Cable Ties-downs 47
Figure 50: Front Cover Assembly 48
Figure 51: Cable Disconnect 49
Figure 52: Duct Adapter Placement 50
Figure 53: Blower Motor Removal 50
Figure 54: Blower Assembly Clips 51
Figure 55: Rubber Washer 51
Figure 56: Heater Assembly 52
Figure 57: Heater Assembly Installation 53
Figure 58: Rubber Washer 53
Figure 59: Blower Assembly Clips 54
Figure 60: Blower Assembly Screws 54
Figure 61: Duct Adapter Placement 55
Figure 62: Cable Connections 56
Figure 63: Front Cover Assembly 56
Figure 64: Equipotential Ground Stud Wiring 57
Figure 65: Cable Harness Cable Ties-downs 58
Figure 66: Cover Screw Locations 59
Figure 67: Filter Installation 59
Figure 68: Filter Cover Installation 60
Figure 69: Power Cord Retaining Bracket 60
Figure 70: Thermistor Silicone 62
Figure 71: Thermistor Removal 62
Figure 72: Duct Adapter Removal 63
Figure 73: Duct Adapter Placement 63
Figure 74: Thermistor Position Within Duct Adapter 64
Figure 75: Cover Screw Locations 65
Figure 76: Filter Removal 67
Figure 77: Warming Unit Mounting Clamps 67
Figure 78: Separated Covers 68
Figure 79: Front Cover Assembly 68
Figure 80: Cable Disconnect 69
Figure 81: Thermistor Cable Removal 70
Figure 82: Blower Assembly Screws 70
Figure 83: Blower Capacitor 71
Figure 84: Blower Motor Removal 71
Figure 85: Blower Assembly Clips 72
Figure 86: Rubber Washer 72
Figure 87: Heater Assembly 73
Figure 88: Warming Unit Mounting Brackets 73
Figure 89: Heater Assembly Installation 74
Figure 90: Rubber Washer 74
Figure 91: Blower Installation 75
Figure 92: Blower Screws 75
Figure 93: Thermistor Cable Installation 76

Figure 94: Capacitor Installation 76
Figure 95: Cable Connections 77
Figure 96: Front Cover Assembly 78
Figure 97: Equipotential Ground Stud Wiring 79
Figure 98: Cable Harness Cable Ties-downs 79
Figure 99: Cover Screw Locations 80
Figure 100: Filter Installation 80
Figure 101: Filter Cover Installation 81
Figure 102: Power Cord Retaining Bracket 81
Figure 103: Spare Parts (Sheet 1) 84
Figure 104: Spare Parts (Sheet 2) 85
Figure 105: Packing 88
Figure 106: Control Panel 93
Figure 107: Remove Screws to Open Case 95
Figure 108: Hour Meter 96
Figure 109: 5300 Schematic Diagram 99

Tables

Table 1: WT-5300 Symbols 6
Table 2: HEPA Filter Replacement Equipment Required 9
Table 3: Hose Replacement Equipment Required 12
Table 4: Power Cord Replacement Equipment Required 14
Table 5: Thermostat Protection Check Equipment Required 17
Table 6: Output Temperature Check Equipment Required 20
Table 7: Replacement Parts and Accessories 83
Table 8: Model WT-5300 Blower Specifications 91
Table 9: Model WT-5300 Cart Specifications 91

Warnings

WARNING: Possible explosion hazard. Do not use the *WarmTouch*® Model WT-5300 patient warming system in the presence of flammable anesthetic agents.

WARNING: Possible electrical shock hazard. To reduce the risk of electrical shock do not remove the back case. Servicing is only to be done by qualified personnel.

WARNING: Possible electric shock hazard. Grounding reliability can be achieved only when the warming system is connected to an equivalent socket marked "HOSPITAL ONLY" or "HOSPITAL GRADE."

WARNING: Possible fire hazard. Prevent the blanket material from coming into contact with a laser or an electrosurgical active electrode; rapid combustion could result.

WARNING: Possible burn hazard. Do not apply heat directly to open wounds. All patient's wounds should be covered while using the warming system.

WARNING: Possible patient burns. Use caution and consider discontinuing use on patients during vascular surgery when an artery to an extremity is clamped. Do not apply the warming system to ischemic limbs. This could possibly cause the patient to be burned.

WARNING: Possible patient burns. Use caution and monitor closely if used on patients with severe peripheral vascular disease. This could possibly cause the patient to be burned.

WARNING: Possible patient burns. Do not warm patients with the warming system hose only. Thermal injury may result. Always attach the hose to a *WarmTouch* blanket before providing warming therapy.

WARNING: *WarmTouch CareDrape*™ and *CareQuilt*® blankets are for single patient use only.

WARNING: MRI scanning. The warming system is not suitable for use during magnetic resonance imaging (MRI) scanning. The warming system may affect the MRI image.

WARNING: Continuously monitor the patient's temperature. Reduce the air temperature or discontinue therapy when normothermia is reached.

Cautions

Caution: Federal (U.S.A.) law restricts the use of the warming system to sale by or on the order of a physician.

Caution: The warming system is fitted with an air filter; however, airborne contamination should be considered when using the warming system.

Caution: If the warming system is mounted on the intravenous (IV) pole, it should be installed with the top of the unit’s handle less than 76 cm (30 inches) above the floor to prevent the IV pole from tipping over.

Caution: If a malfunction occurs in the warming system, discontinue use. Notify your sales/service center of the malfunction. Service is only to be done by qualified personnel.

Caution: The Model WT-5300 should not be operated in the presence of electromagnetic fields that are greater than 3 Volts/meter. This could cause shutdown of the Model WT-5300 by the fail-safe function within the equipment.

Caution: Ensure that the patient is dry or the warming system may be ineffective.

Intended Use

The *WarmTouch* Model WT-5300 Patient warming system (warming unit and blanket) is intended for prevention and treatment of hypothermia. For example, with the surgical patient, the patient in the preoperative holding area, the pregnant woman who shivers during epidural anesthesia due to hypothermia, or any patient who is uncomfortable anywhere in the cold critical care environment.

Manual Availability

The most recent revision of this manual is available on the Internet at:

http://www.mallinckrodt.com/respiratory/resp/Serv_Supp/ProductManuals.html

Background Information

There are numerous ways of warming your patient, from cotton blankets to water mattresses. Research has shown that low temperatures surrounding the patient are a major factor contributing to hypothermia.[1), 2)] The warming system covers the patient with warm air and actively transfers heat across the skin. The result is to achieve normal thermia.

In creating this warm customized pocket of air around the hypothermic patient, it is important to note that stagnant air, even if it is warm, does not work as an effective heat transfer medium. Stagnant air acts as an insulator, preventing the boundary layer of molecules next to the skin surface from transferring heat.

Forced air warming causes warmed air molecules to flow over cooler skin surface. It is this active flow of warmed molecules that acts as a heat transfer medium. With the warming system, air is warmed and delivered into a lightweight blanket (*CareQuilt* or *CareDrape* Blanket) that rests over or under the patient. The *CareQuilt* and *CareDrape* blankets have many small perforations on the underside that allow air to exit the blanket and surround the patient.

1) Morris RH, Wilkey BR. “The Effects of the Ambient Temperature on Patient Temperature During Surgery Not Involving Body Cavities.” *Anesthesiology* 32:102-107, 1970.
2) Morris RH. “Influence of Ambient Temperature on Patient Temperature During Intra-abdominal Surgery.” *Annals of Surgery* 173:230-233, 1971.

Safety Features

The Warming System is designed to give healthcare professionals more control over the patient's core body temperature. There are several safety features of the warming system which make it safe and appropriate for such use.

Customized Warming Therapy

Clinicians select temperature range setting at the onset of warming therapy to help ensure the appropriate setting is selected for every patient.

Automatic Temperature Stepdown

The warming system provides a 45-minute temperature stepdown feature. When in the Boost mode, blower temperature will automatically drop to the high mode after each 45-minutes of use. The temperature may be reset to the Boost mode by selecting the Boost temperature on the unit front panel to start another 45-minute cycle.

Automatic Over Temperature Shutdown

The automatic temperature controller and two back-up systems help to ensure temperature will not reach excessive levels. If necessary, the back-up systems automatically turn off the heater and illuminates the warning light. The warming system heater will start producing heat when the warming system temperature drops to approximately 55ºC to 57ºC.

Warning Light

When the warning light on the control panel is illuminated, it indicates that one of the two thermostats has turned off the heater. The reason for the heater turn-off should be investigated as soon as possible after use.

HEPA Filter

The system's High Efficiency Particulate Air Filter is 99.97% efficient at 0.3-micron particle size.

Wheel Locks

The cart is equipped with two wheel locks. The wheel locks prevent the cart from moving while in use. The wheel locks must be released when moving the cart. Press the wheel lock arm down to lock the wheel. Lift the wheel lock arm to release the wheel lock. See Figure 1.

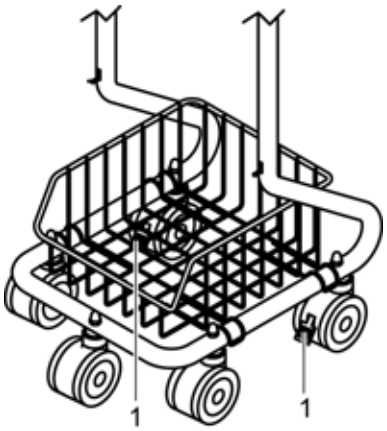
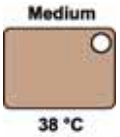
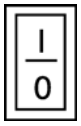


Figure 1: Cart Wheel Lock

Symbols

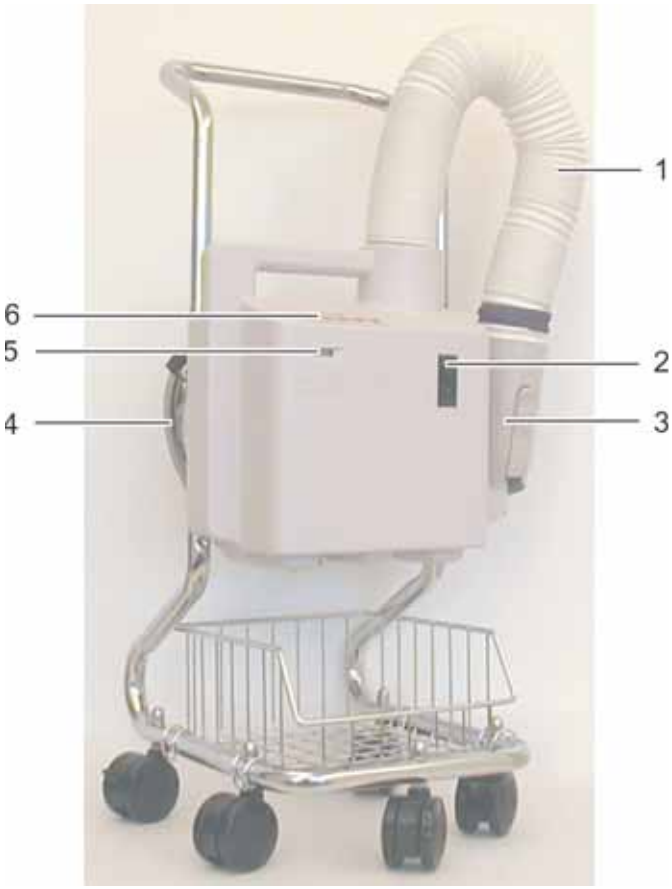
The symbols identified in Table 1 are the symbols used on the WT-5300 and all WT-5300 labeling.

Table 1: WT-5300 Symbols

	Attention symbol, consult accompanying documentation
	Temperature Control Low (32 °C)
	Temperature Control Medium (38 °C)
	Temperature Control High (43 °C)
	Temperature Control Boost (45 °C for 45 minutes)
	I Power On 0 Power Off
	Protection Class I Protection Type BF

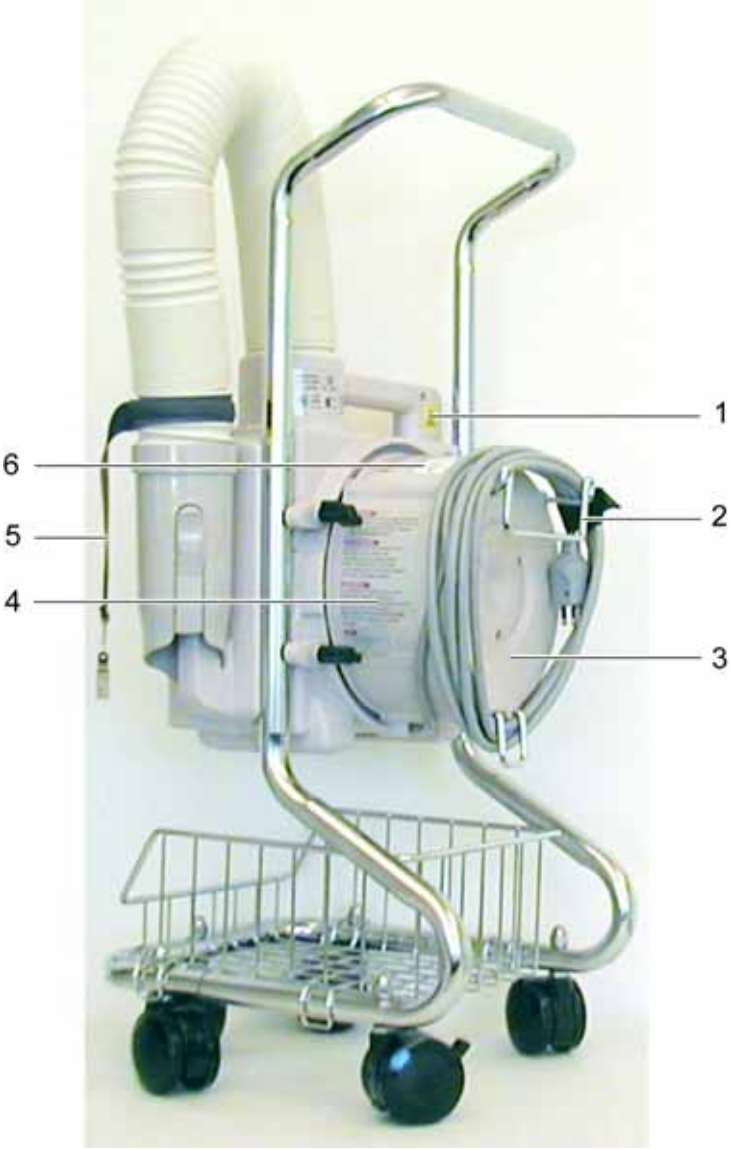
Description of the Warming System

The *WarmTouch* Model WT-5300 Patient warming system (Figure 2 and Figure 3), *CareQuilt* and *CareDrape* blankets are intended for prevention and treatment of hypothermia. For example, with the surgical patient, the patient in the preoperative holding area, the pregnant woman who shivers during epidural anesthesia due to hypothermia, or any patient who is uncomfortable cold in the critical care environment.



1 — Hose	4 — Power Cord
2 — Main Power Switch	5 — Hour Meter
3 — Nozzle	6 — Control Panel

Figure 2: Model WT-5300 Front View



1 — Over-Temperature Test Port	4 — Warning Label
2 — Bed Hook Bracket	5 — Nozzle Strap with Clip
3 — Filter Cover	6 — Instruction Label

Figure 3: Model WT-5300 Back View

Caution: The institution should follow local governing ordinances and recycling instructions regarding disposal or recycling of filter and device components or end of life of the product.

HEPA Filter Replacement

The warming system filter should be replaced after every 2,000 hours of use. Contact Nellcor's Customer Service Department (1.800.635.5267) or your local Nellcor representative to purchase new filters. The correct filter will be sent to your hospital for installation.

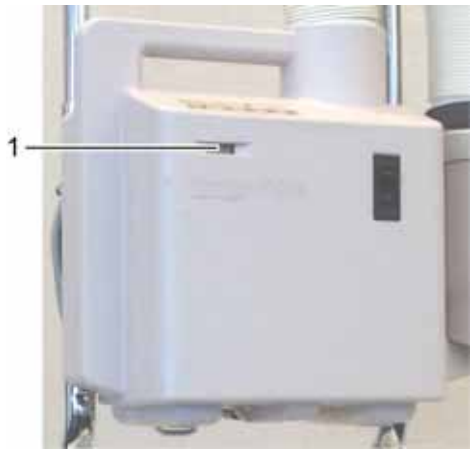
Caution: Only qualified hospital personnel should replace the air filter.

The warming system total operating hours and the date of filter installation should be recorded on the new filter label and on the unit label when the filter is installed. See Figure 4 for the location of the Hour Meter on the warming system.

Note: The warming system must be operating to read the total operating hours meter.

Table 2: HEPA Filter Replacement Equipment Required

Equipment	Description/Use
Phillips Screwdriver	#2, removing screws

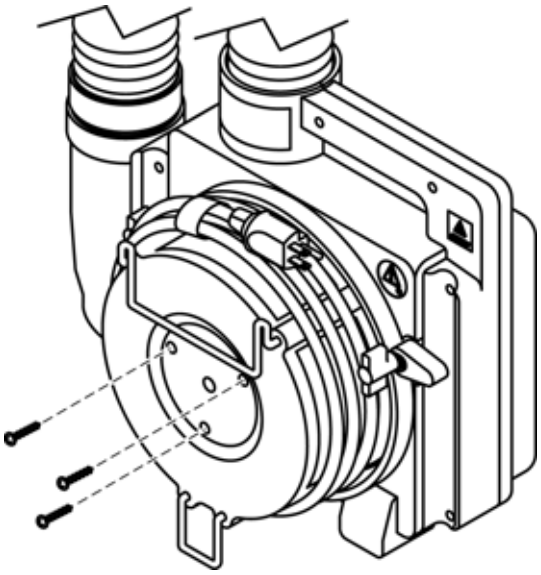


1 — Operating Hours Meter

Figure 4: Operating Hours Meter

WARNING: Do not operate the warming system with the back cover removed.

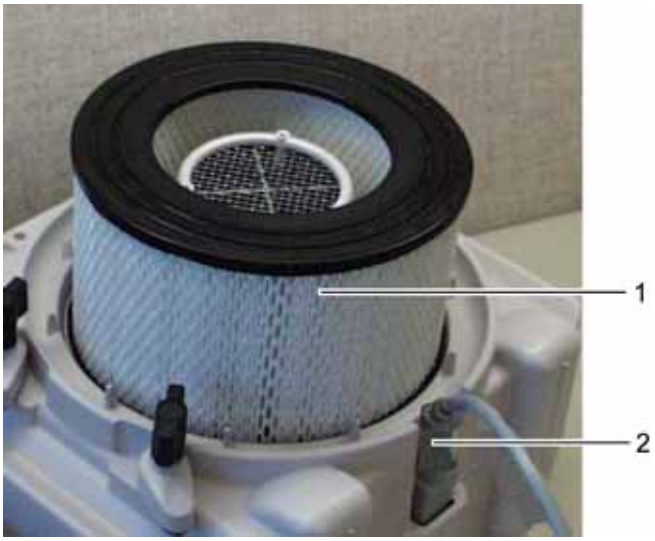
1. Write the date and total hours of operation of the warming system on the new filter label and unit label.
2. Unplug the warming system.
3. Lay the warming system on the front cover.
4. Unwrap the power cord from the rear of the warming system.
5. Remove the three screws from the rear of the warming system. See Figure 5.



Three Panel Screws

Figure 5: Rear Panel Screws

6. Remove the *WarmTouch* Model WT-5300 Patient Warming System back panel.



1 — HEPA Filter

2 — Power Cord Strain Relief

Figure 6: HEPA Filter

7. Remove the filter. See Figure 6.

8. Place the new filter into the warming system.

9. Ensure that the power cord's female connector is fully seated into the warming system case.

10. Place the warming system back panel on the case and insert the power cable into the power cable slot on the bottom of the case.

11. Align the back case with the three screw holes in the filter and install the three screws holding the back case to the unit.

Hose Replacement

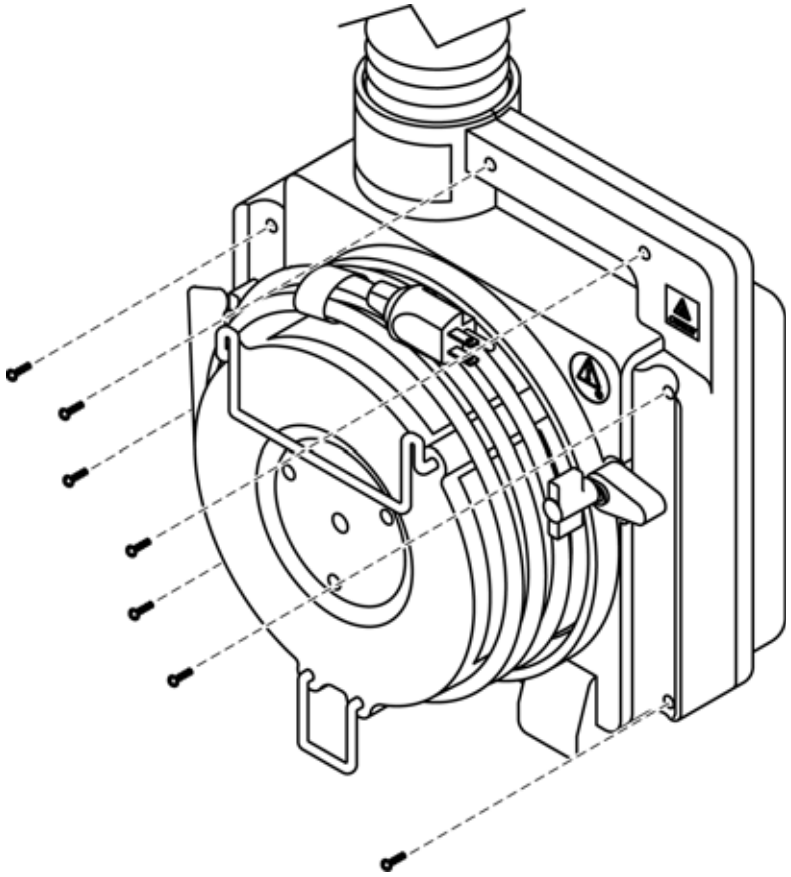
If the warming system hose is damaged, contact Nellcor's Customer Services Department (1.800.635.5267) or your local Nellcor representative to obtain a replacement hose. The hose for the warming system is made of plastic reinforced with wire.

Caution: Only qualified hospital personnel should replace the hose.

Table 3: Hose Replacement Equipment Required

Equipment	Description/Use
Phillips Screwdriver	#2, removing screws
Needle-Nose Pliers	Bending hose wire

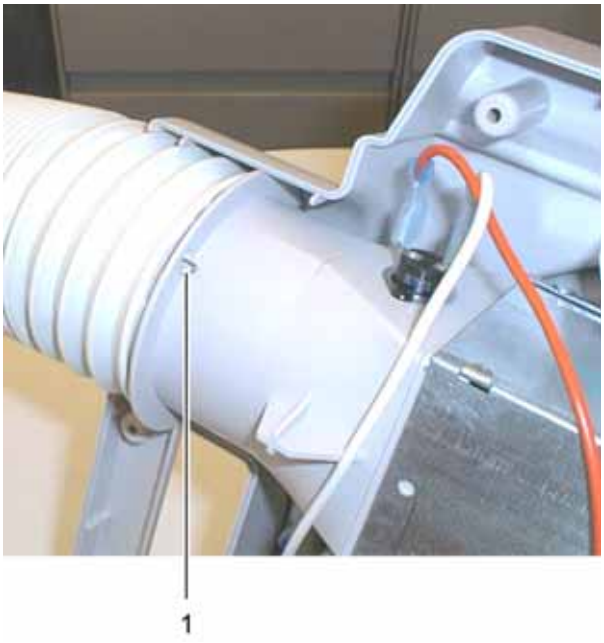
1. Unplug the warming system.
2. Place the warming system on a workbench with the back of the unit facing you.
3. Remove the 7 screws holding the case together. See Figure 7.



Seven Screws

Figure 7: Back of Case

4. Open the top of the case assembly far enough to access the hose and the hose retaining wire. See Figure 8.



1 — Hose Retaining Wire

Figure 8: Hose Retaining Wire

5. Straighten the hose retaining wire.
6. Remove the hose from the warming system.
7. Install the new hose. Ensure that the hose retaining wire is threaded through the hose retaining wire hole.
8. Bend the hose retaining wire to ensure that the hose does not detach from the warming system.
9. Close the warming system case.
10. Install the 7 screws to hold the case together. See Figure 7.

Power Cord Replacement

The warming system is equipped with a detachable power cord. If the power cord is damaged, contact Nellcor's Customer Services Department (1.800.635.5267) or your local Nellcor representative.

Caution: Only qualified hospital personnel should replace the power cord.

Table 4: Power Cord Replacement Equipment Required

Equipment	Description/Use
Allen Wrench	3/32 inch, loosening retaining bracket

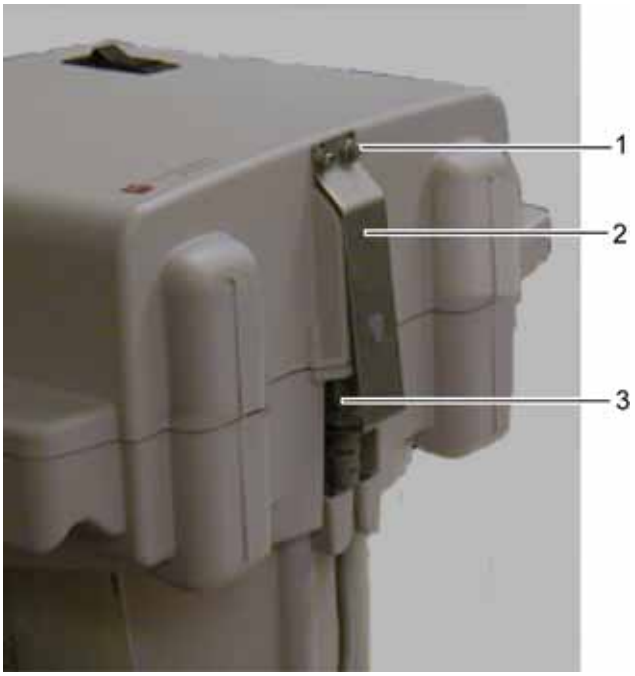
1. Unplug the warming system power cord from the AC outlet.

2. Place the warming system unit on a workbench with the bottom of the unit facing you.

3. Unwind the power cord from the warming unit case.

Note: The power cord retaining bracket screws have retaining nuts. Do not unscrew the screws enough to break the retaining nuts.

4. Loosen the power cord retaining bracket screws enough to pull the bracket away from the power cord connector. See Figure 9.



1 — Power Cord Retaining Bracket Screws

2 — Power Cord Retaining Bracket

3 — Power Cord Connector

Figure 9: Power Cord Routing

5. Disconnect the power cord connector from the warming unit.

6. Remove the power cord from the power cord routing bracket.

7. Connect the new power cord connector to the warming unit.

8. Insert the power cord into the power cord routing bracket. It may be necessary to use a screwdriver to separate the power cord routing bracket.

9. Tighten the power cord retaining bracket screws.

Nozzle Replacement

If the nozzle is damaged, contact Nellcor's Customer Services Department (1.800.635.5267) or your Nellcor representative. The nozzle is held in place by four clips on the hose assembly. Pull and twist the nozzle to remove it. To replace the nozzle, push the new nozzle over the four clips on the hose assembly.

Cleaning the Warming System

Caution: Do not spray, pour, or spill any liquid on the warming system, its accessories, connectors, switches, or openings in the case.

For *surface-cleaning* and *disinfecting*, follow your institution's procedures or:

- The warming system may be *surface-cleaning* by using a soft cloth dampened with either a commercial, nonabrasive cleaner or a solution of 70% alcohol in water, and lightly wiping the surfaces of the monitor.
- The warming system may be *disinfected* using a soft cloth saturated with a 10% solution of chlorine bleach in tap water.

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Thermostat Protection Check

This procedure checks to ensure that the thermostat protection controls are working properly. This procedure should be performed before returning the warming system into service. Table 5 lists the equipment required for the thermostat protection check.

No calibration of the thermostat protection is required or possible. If the test time or temperatures are outside the allowable range, factory service is required. Contact Nellcor's Customer Services Department (1.800.635.5267) or your local Nellcor representative.

Table 5: Thermostat Protection Check Equipment Required

Equipment	Description/Use
Temperature Probe	Mon-a-Therm® subcutaneous temperature probe, or equivalent, and monitor with an accuracy of ±0.2 degrees C
Tape	To hold the temperature probe in place
Stopwatch	Manual or electronic
Jumper wire with alligator clips	8 to 30 centimeters (3 to 12 inches) long, alligator clip at each end, 12 gauge minimum
Phillips Screwdriver	#2
WarmTouch CareDrape Lower Body Blanket	To complete patient warming system.

1. Lay the temperature probe beside the warming system nozzle at the end of the hose and bend approximately 4 centimeters (1.5 inches) of the temperature probe into the nozzle opening.

2. Position the tip of the temperature probe so that it is centered in the middle of the nozzle opening and is inside the nozzle approximately 2.5 to 5 centimeters (1 to 2 inches).

3. Tape the probe in place.

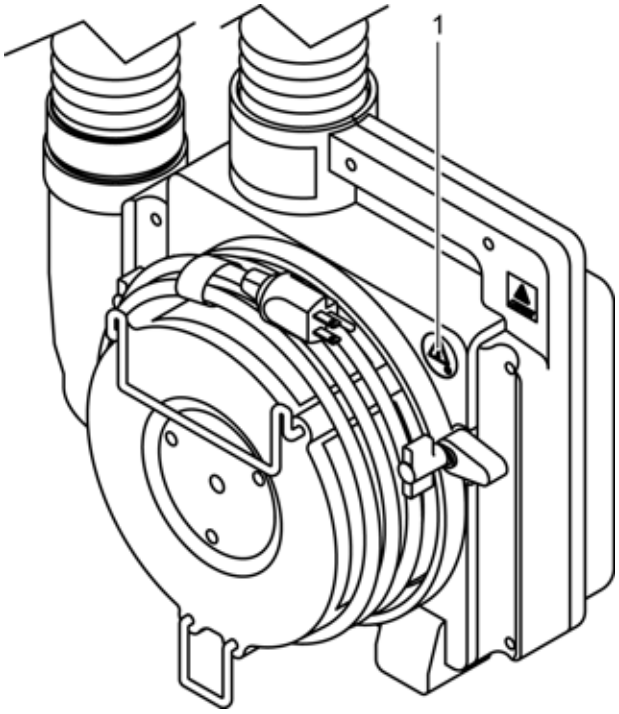
4. Connect the probe to the temperature monitor.

5. Connect the nozzle to the blanket.

6. Unplug the warming system.

7. Loosen the over-temperature test port screw. See Figure 10.

8. Slide the over-temperature test port cover to the side.



1 — Over-Temperature Test Port

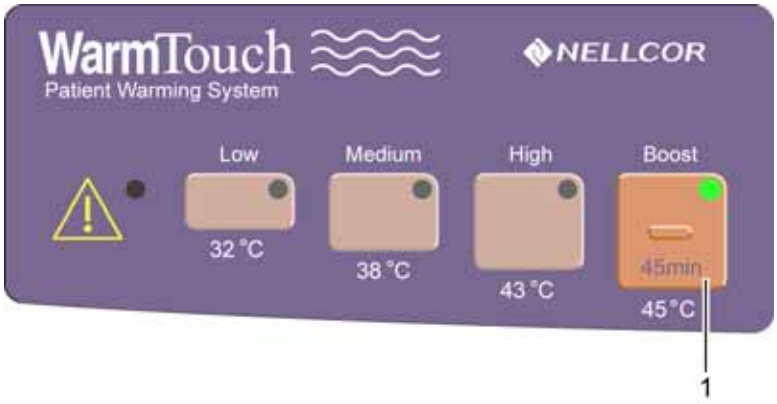
Figure 10: Over-Temperature Test Port

WARNING: Possible Patient Injury. Connecting the jumper wire disables (shorts out) the thermistor that is part of the temperature control system and is only for use by qualified personnel.

9. Connect the jumper wire across the two terminals in the over-temperature test port.

10. Plug in the warming system and turn it on.

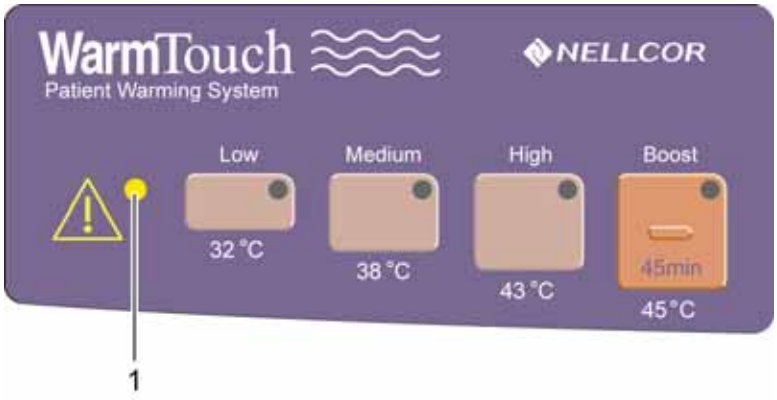
11. Select the Boost temperature setting. See Figure 11.



1 — Boost Temperature Setting

Figure 11: *WarmTouch* Boost Temperature Setting

12. When the monitored temperature exceeds 46 degrees C, start the stopwatch.



1 — Warning Light

Figure 12: Warning Light

13. When the Warning Light indicator lights, stop the stopwatch. See Figure 12.

14. The stopwatch should indicate 5 minutes or less, and the temperature monitor should not exceed 58 degrees C.

15. Turn off the warming system and unplug it.

WARNING: Possible patient injury. Connection of the jumper wire disables (shorts out) the thermistor that is part of the temperature control system and is only for use by qualified personnel. The jumper wire must be removed.

16. Remove the jumper wire from the over-temperature test port. See Figure 10.

17. Close the over-temperature test port and tighten the screw.

18. Disconnect the warming system from the blanket.

19. Allow the warming system to cool for 30 minutes before using the unit on a patient.

Output Temperature Check

This procedure measures the warming system output air temperature at the input to the blanket. This procedure should be accomplished before returning the warming system into service. Table 6 lists the equipment required for the thermostat protection check.

No calibration of the temperature control circuit is required or possible. If the test temperatures are outside the allowable range, factory service is required. Contact Nellcor's Customer Services Department (1.800.635.5267) or your local Nellcor representative.

Table 6: Output Temperature Check Equipment Required

Equipment	Description/Use
Temperature Probe	Mon-a-Therm subcutaneous temperature probe, or equivalent, and monitor with an accuracy of ±0.2 degrees C
Tape	To hold the temperature probe in place
WarmTouch CareDrape Lower Body Blanket	To complete patient warming system.

1. Lay the temperature probe alongside the warming system nozzle at the end of the hose and bend approximately 4 centimeters (1.5 inches) of the temperature probe into the nozzle opening.

2. Position the tip of the temperature probe so that it is centered in the middle of the nozzle opening and is inside the nozzle approximately 2.5 to 5 centimeters (1 to 2 inches).

3. Tape the probe in place.

4. Connect the probe to the temperature monitor.

5. Connect the nozzle to the blanket.

6. Extend the warming system hose to configuration shown in Figure 13.

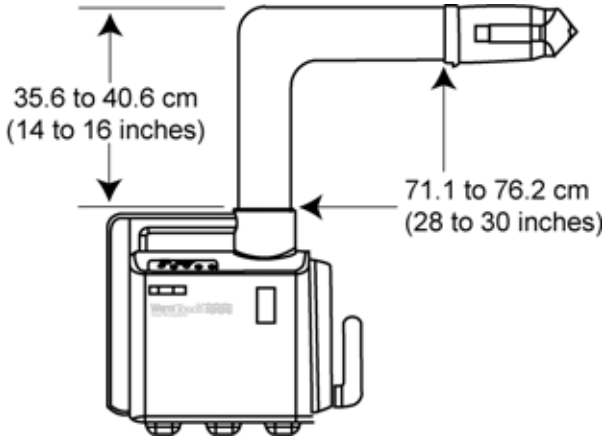
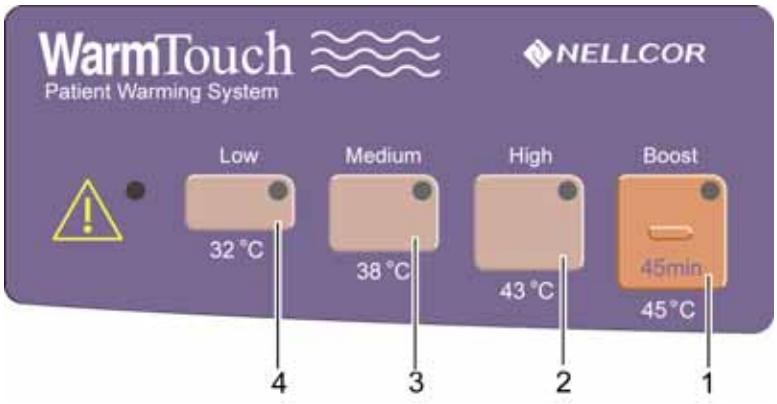


Figure 13: Output Temperature Setup

7. Turn on the warming system.

8. Select the low temperature setting. See Figure 14.



1 — Boost Temperature Select	3 — Medium Temperature Select
2 — High Temperature Select	4 — Low Temperature Select

Figure 14: Temperature Selection

9. Allow the temperature to stabilize (8 to 10 minutes). The temperature monitor should indicate 30.0 ºC to 34.0 ºC.

10. Select the medium temperature setting.

11. Allow the temperature to stabilize (8 to 10 minutes). The temperature monitor should indicate 36.0 ºC to 40.0 ºC.

12. Select the high temperature setting.

13. Allow the temperature to stabilize (8 to 10 minutes). The temperature monitor should indicate 41.0 ºC to 45.0 ºC.

14. Select the Boost temperature setting.

15. Allow the temperature to stabilize (8 to 10 minutes). The temperature monitor should indicate 44.0 ºC to 46.0 ºC.

16. Turn off the warming system.

17. Disconnect the warming system nozzle from the blanket.

18. Remove the temperature probe from the warming system nozzle.

Safety Tests

The warming system is provided with a ground stud to allow safety testing without opening the case.

1 — Ground Stud

Figure 15: Ground Stud

The warming system meets the standards of CSA C22.2 No. 125 (Risk Class 2) and UL 544.

Applicable tests for these standards are listed below. Technicians should be familiar with the standards applicable to their institution and country. Test equipment and its application must comply with the applicable standard.

- Ground Integrity. See page 92 for test values.
- Earth Leakage Current. See page 92 for test values.
- Enclosure Leakage Current. See page 92 for test values.

Warning: Before attempting to open or disassemble the warming unit, disconnect the power cord from the AC power source.

Caution: Observe ESD (electrostatic discharge) precautions when working within the warming unit.

Caution: Repairs to the warming unit should only be accomplished by trained service technicians.

Follow local government ordinances and recycling instructions regarding the disposal of the warming unit and/or parts.

Filter Cover Assembly Replacement

The replacement Filter Cover Assembly is delivered assembled with:

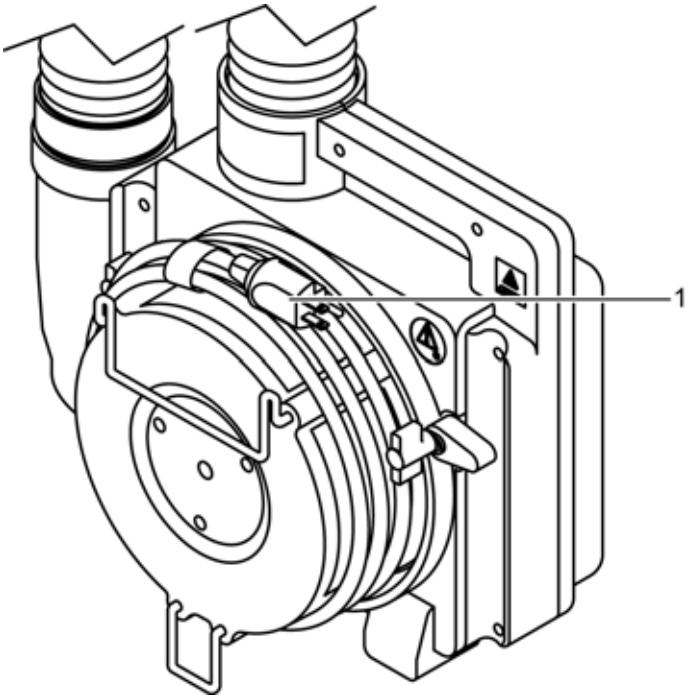
- 1 — filter cover
- 1 — bed hook
- 1 — foot, filter cover, short
- 4 — 8-32 truss HD screws

The tools required for this procedure are:

Tool	Parameter/Use
Phillips screw driver	#2
Torque driver	8 in./lbs to 12 in./lbs (20 cm/kg to 30 cm/kg)

Use the following procedure to replace the filter cover assembly.

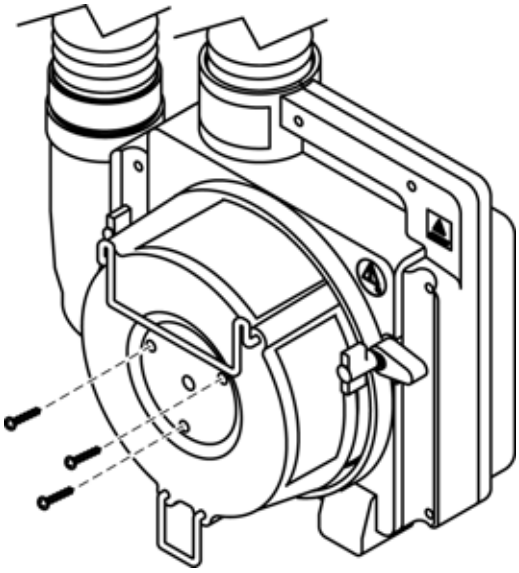
1. Unplug the warming system power cord from the AC outlet.
2. Place the warming system unit on a workbench with the bottom of the unit facing you.
3. Unwind the power cord from the warming unit case. See Figure 16.
4. Disconnect the power cord connector from the warming unit.



1 — Power Cord

Figure 16: Power Cord

5. Remove the 3 rear panel screws from the warming unit. See Figure 17.



Three Screws

Figure 17: Rear Panel Screws

6. Slide the filter cover assembly from the warming unit.

7. Place the new filter cover assembly on the warming unit and install the 3 screws. The screws should be torqued to 8 in./lbs to 12 in./lbs (20 cm/kg to 30 cm/kg). See Figure 17.

8. Install the power cord on the warming unit. See Figure 16.

Separating the Warming Unit Front and Rear Covers

This procedure requires:

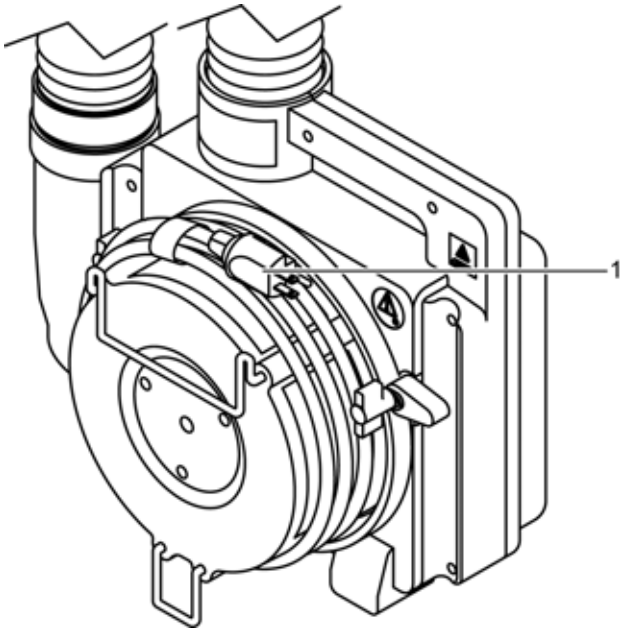
Phillips screw driver, #2
Socket wrench, 10 mm

Use the following procedure to separate the warming unit covers.

1. Unplug the warming system power cord from the AC outlet.

2. Place the warming system unit on a workbench with the bottom of the unit facing you.

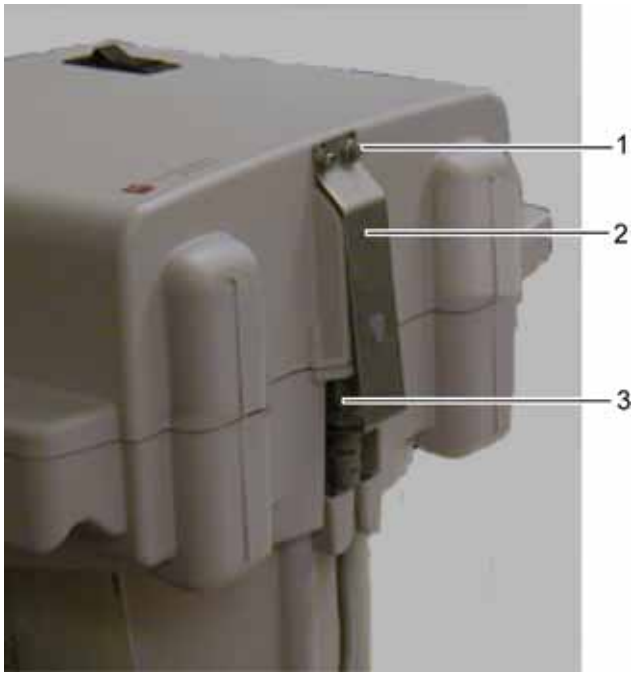
3. Unwind the power cord from the warming unit case. See Figure 18.



1 — Power Cord

Figure 18: Power Cord

4. Loosen the power cord retaining bracket (Figure 19, item 2) by loosening the retainer bracket screws (item 1).



1 — Retaining bracket screws	3 — Power cord connector
2 — Retaining bracket	

Figure 19: Power cord Removal

5. Disconnect the power cord connector from the warming unit. See Figure 19, item 3.

6. Remove the seven screws holding the front and rear covers together. See Figure 20.

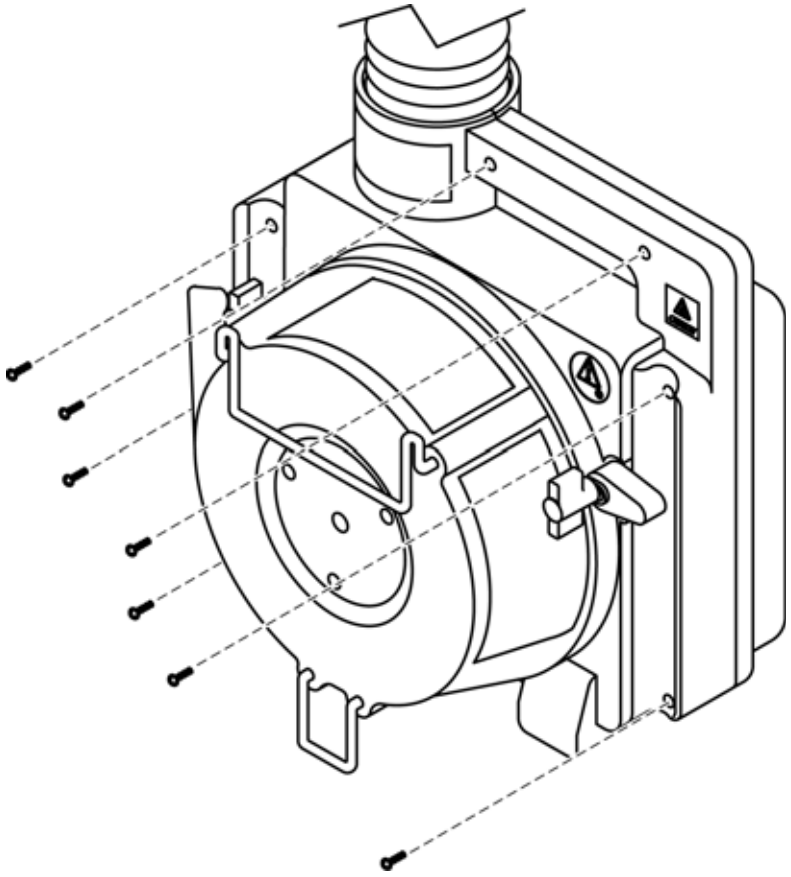


Figure 20: Cover Screw Locations

Caution: Separate the front and rear covers very carefully. The wires connected between the covers are short and may be damaged if too much pressure is applied to them.

7. Carefully separate the front and back covers. See Figure 21.

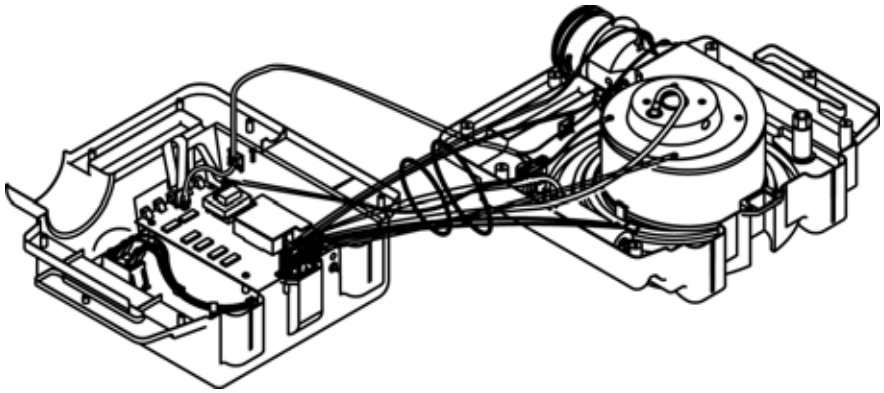


Figure 21: Separated Covers

Front Cover Assembly Replacement

The replacement front cover assembly comes assembled with:

- 1 — front enclosure
- 1 — key pad
- 1 — lens
- 1 — ground symbol label
- 1 — cable tie mount
- 1 — cable tie
- 1 — ground equipotential label
- 1 — 6.5 mm (0.25 inch) hole for equipotential ground pin

The tools required for this procedure are:

Tool	Parameters/Use
Phillips screwdriver	#2
Torque driver/wrench	4 in./lbs to 12 in./lbs (10 cm/kg to 30 cm/kg)
	36 in./lbs to 40 in./lbs (91 cm/kg to 112 cm/kg)
Wire cutter	Cutting cable tie-downs
Socket wrench	10 mm

Use the following procedure to replace the front cover assembly.

1. Separate the front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

2. Cut the cable harness cable tie-down. See Figure 22, item 1.

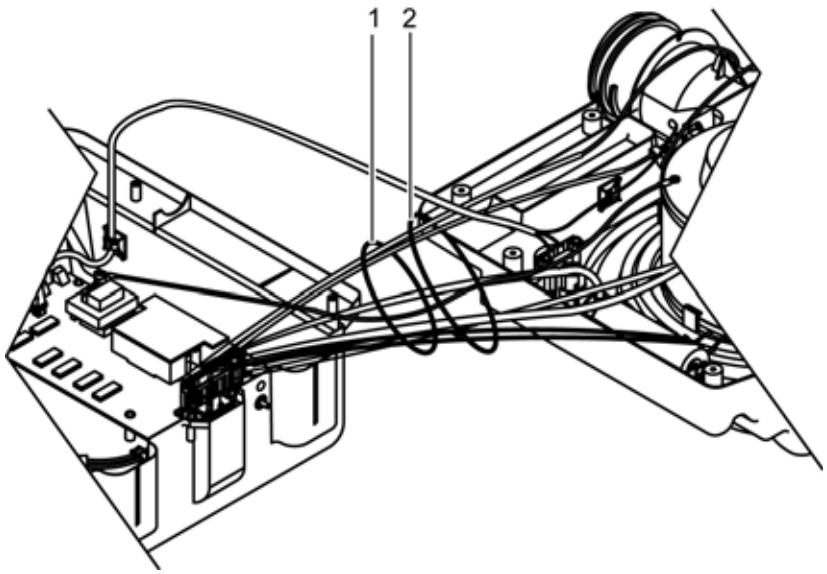
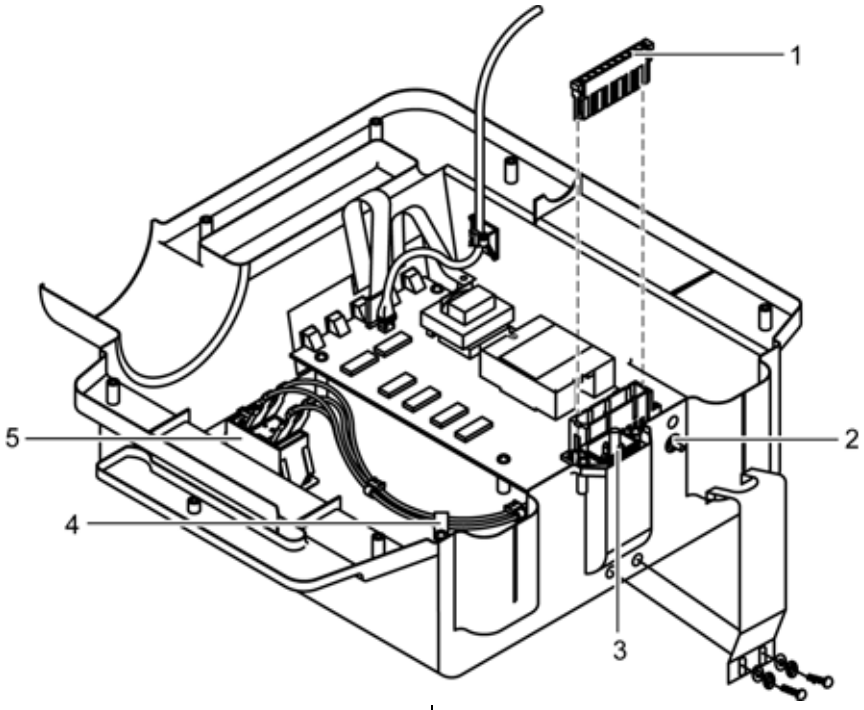


Figure 22: Cable Harness Cable Ties-downs

3. Disconnect the 9-pin connector from the universal PCB. See Figure 23, item 1.



1 — 9-pin connector	4 — Cable tie-down
2 — Equipotential ground terminal	5 — Power switch
3 — AC power connector	

Figure 23: Front Cover Assembly

4. Disconnect the equipotential ground stud and remove it from the front cover assembly. See Figure 23, item 2.

5. Remove the AC power connector from the front cover assembly. See Figure 23, item 3.

6. Remove the cable tie-down from the front cover assembly. See Figure 23, item 4.

Caution:Write down the color code of each wire connected to the power switch. This will ensure that the wires will be reconnected properly.

7. Disconnect the four wires from the power switch. See Figure 23, item 5.

8. Depress the four clips on the power switch and push the power switch through the front cover assembly. See Figure 24.

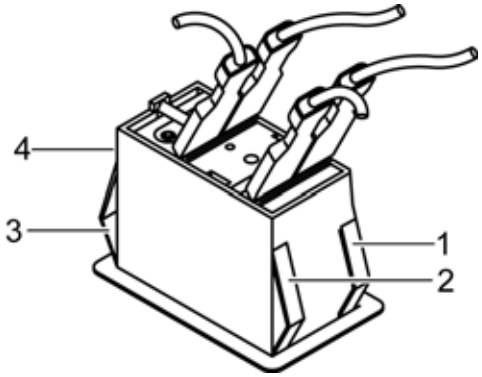


Figure 24: Power Switch Removal

9. Cut the cable tie. See Figure 25, item 1.

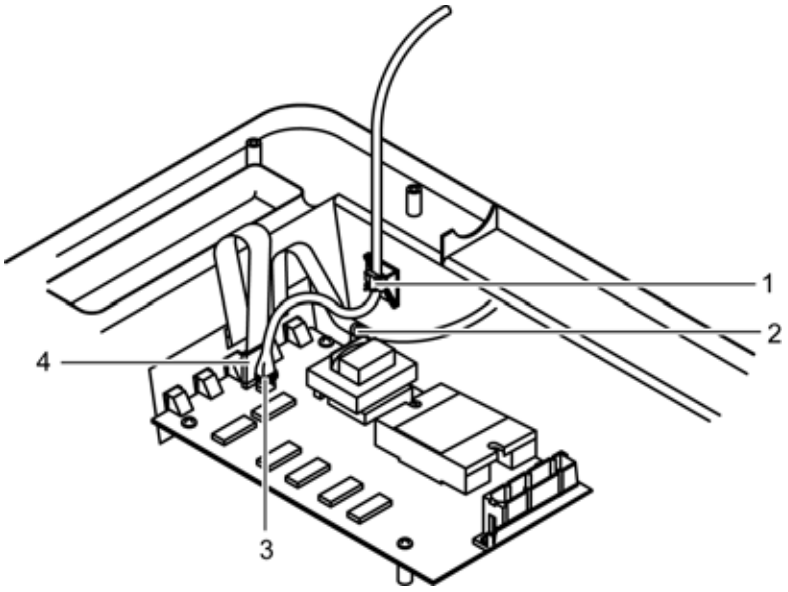


Figure 25: Cable Disconnect

10. Remove the ground screw. See Figure 25, item 2.

11. Cut the cable tie-down holding the thermistor cable to the connector. See Figure 25, item 3.

12. Disconnect the thermistor cable connector. See Figure 25, item 3.

13. Disconnect the ribbon cable connector. See Figure 25, item 4.

14. Remove the four screws holding the universal PCB onto the front cover assembly. See Figure 26.

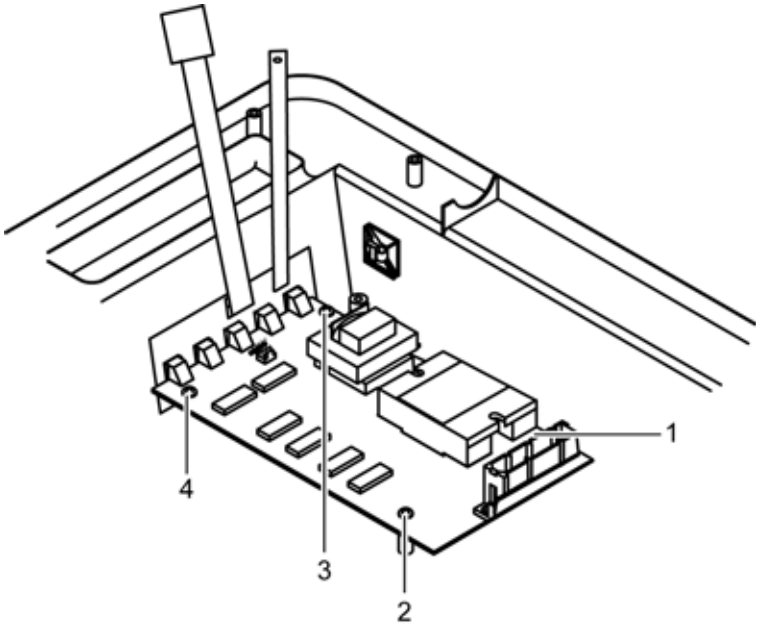


Figure 26: Universal PCB Screws

15. Carefully lift the universal PCB out of the front cover assembly.

16. Discard the old front cover assembly.

Caution: Carefully align the five lights on the universal PCB with the control panel key pad push buttons. Failure to do so could damage the key pad or the universal PCB lights. See Figure 27.

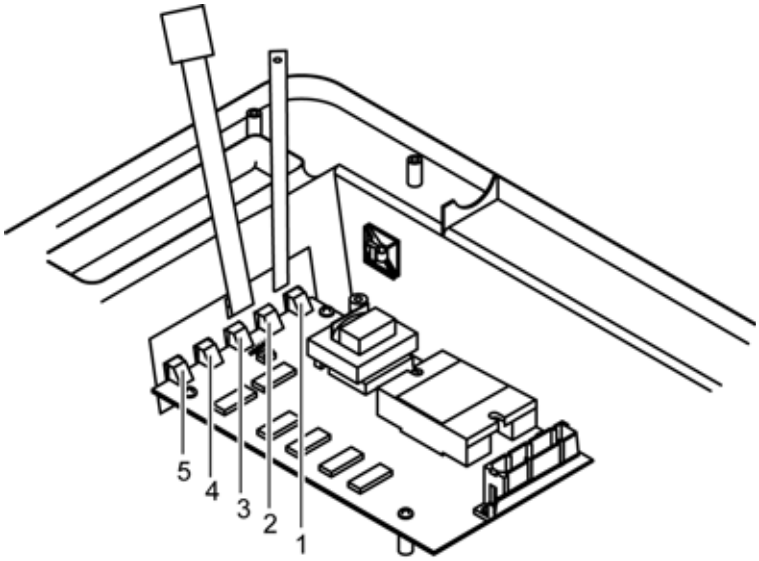


Figure 27: Universal PCB Lights

17. Carefully place the universal PCB into the replacement front cover assembly and install the four mounting screws. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 28.

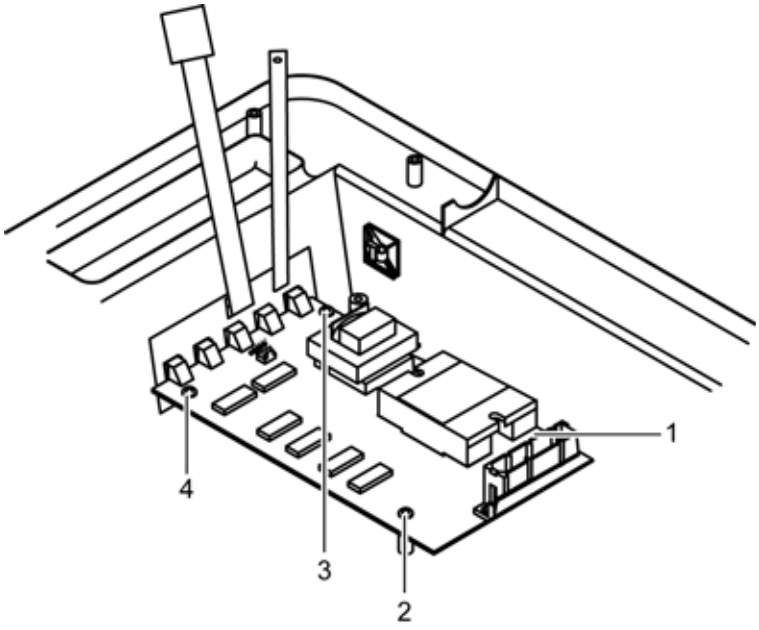


Figure 28: Universal PCB Screws

18. Connect the ribbon cable connector. See Figure 29, item 4.

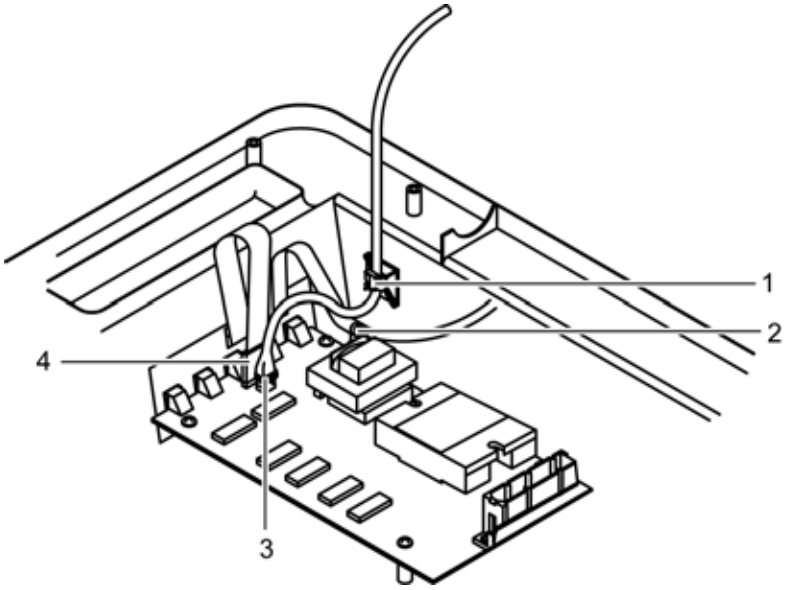


Figure 29: Cable Connections

19. Connect the thermistor cable connector. See Figure 29, item 3.

20. Install cable tie-down around the thermistor cable connector and universal PCB connector. See Figure 29, item 2.

21. Connect the key pad grounding strap and blower ground wire. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 29, item 2.

22. Install the cable tie around the blower ground cable and the cable tie-down mount. See Figure 29, item 1.

23. Slide the power switch through the front of the front cover assembly until the four clips on the power switch click into place. Ensure that the “0”, marked on the front of the power switch, is towards the bottom of the front cover assembly. See Figure 30.

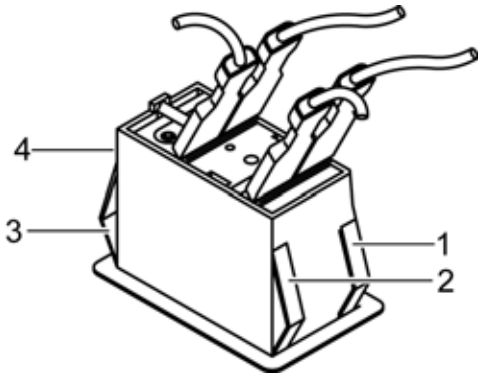


Figure 30: Power Switch Clips

24. Connect the four wires to the power switch. Refer to the wire colors recorded in accordance with the Caution before Step 7. See Figure 31, item 5.

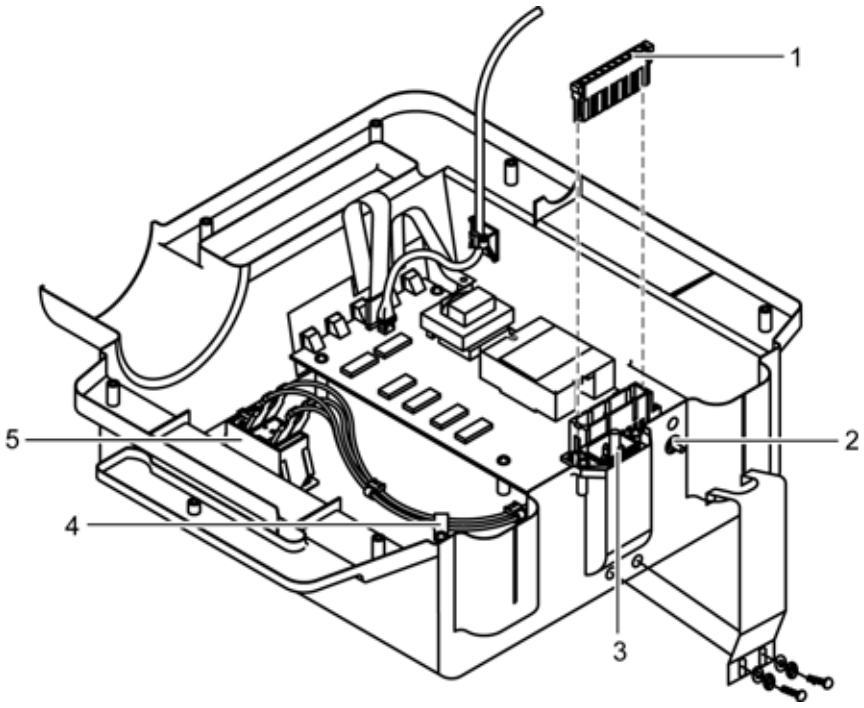
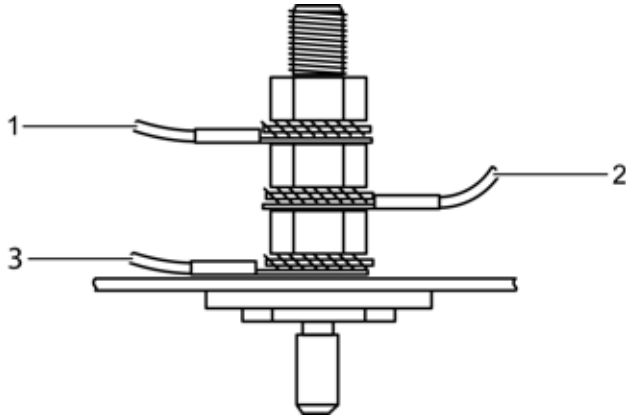


Figure 31: Front cover Assembly Component Locations

25. Install the cable tie around the power switch cables. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 31, item 4.

26. Install the AC power connector into the front cover assembly. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 31, item 3.

27. Install Equipotential Ground (Figure 31, item 2) and the ground wires to the equipotential ground. The nuts should be torqued to 36 in./lbs to 44 in./lbs (91 cm/kg to 112 cm/kg). See Figure 32.



1 — Blower Housing Ground
2 — Blower Motor Ground
3 — AC Power Connector Ground

Figure 32: Equipotential Ground

28. Connect the 9-pin connector to the universal PCB. See Figure 31, item 1.

29. Install the cable harness cable tie-down. See Figure 33, item 1.

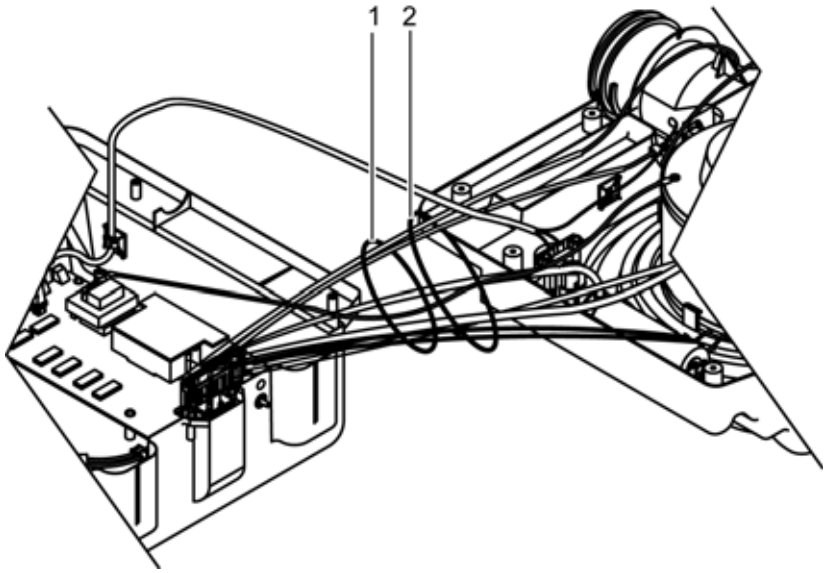


Figure 33: Cable Harness Cable Ties-downs

Caution: Ensure that the cable harness between the two cover halves is not pinched by the covers when joining the front and rear cover assemblies.

30. Carefully align the front and rear cover assemblies and install the seven screws. The screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 34.

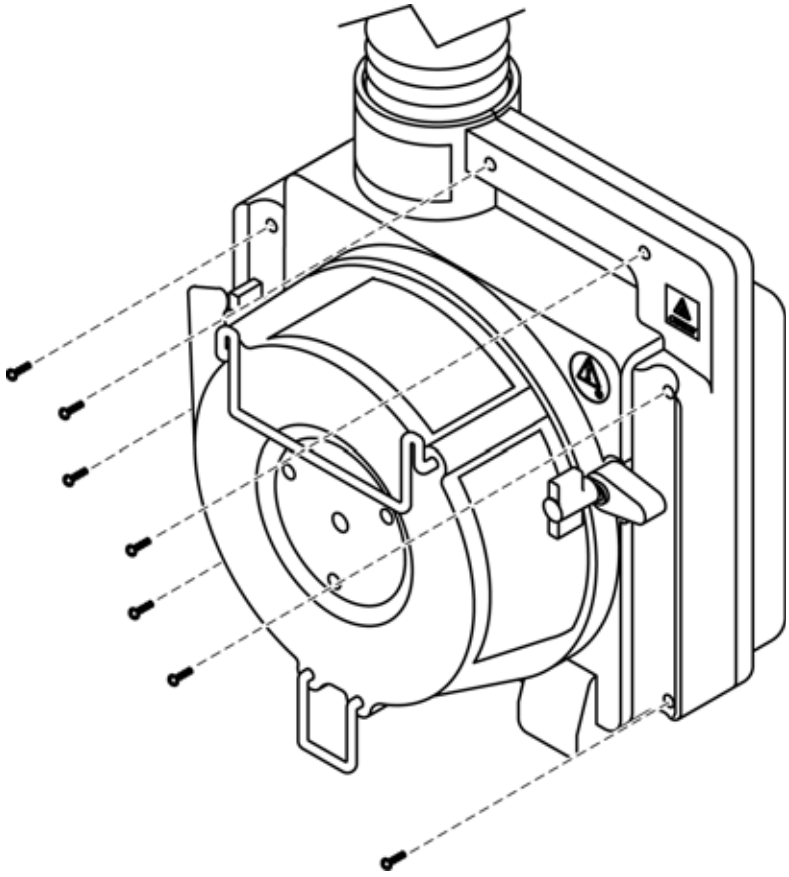


Figure 34: Cover Screw Locations

31. Attach the AC power cord to the warming unit.

32. Install the power cord retaining bracket (Figure 35, item 2), by tightening the bracket screws (item 1).

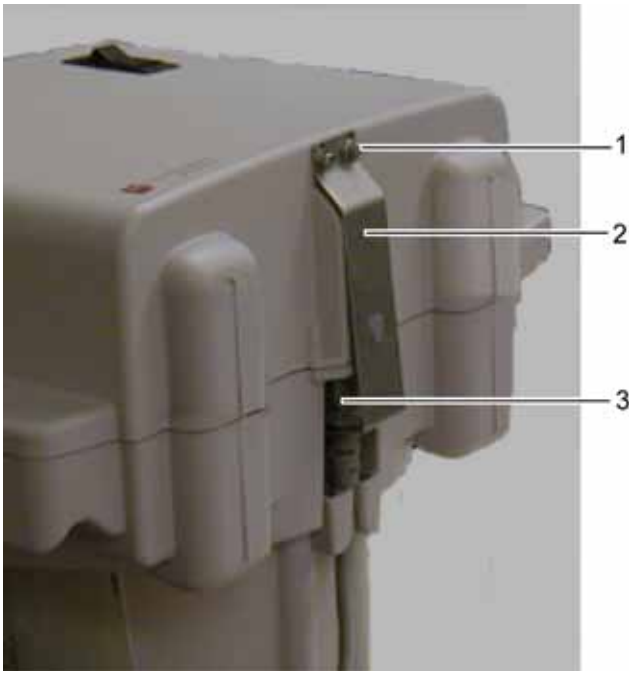


Figure 35: Power Cord Retaining Bracket

33. Perform the following checks/test to verify proper operation of the warming unit prior to returning the warming unit into service:

    - *Thermostat Protection Check* on page 17
    - *Output Temperature Check* on page 20
    - *Safety Tests* on page 22

Universal PCB Replacement

The replacement universal PCB comes fully assembled except for the solid state relay assembly.

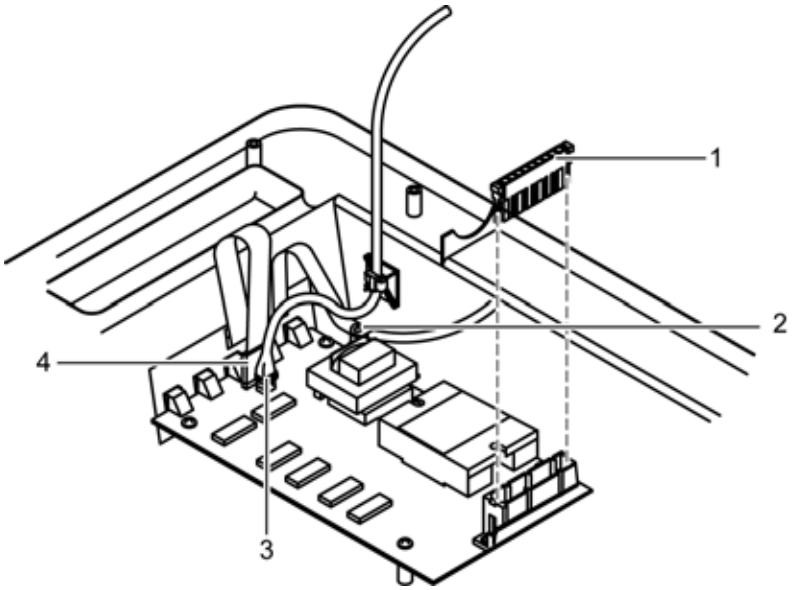
The tools required for this procedure are:

Tool	Parameter/Use
Phillips screwdriver	#2
Torque driver	4 in./lbs to 20 in./lbs (10 cm/kg to 51 cm/kg)
Wire cutter	Cut cable tie-downs and jumpers

Use the following procedure to replace the universal PCB assembly.

1. Separate the front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

2. Disconnect the 9-pin connector from the universal PCB. See Figure 36, item 1.



1 — 9-pin connector	3 — Thermistor cable connector
2 — Key pad and blower ground	4 — Key pad ribbon cable connector

Figure 36: Universal PCB Connections

3. Remove the thermistor cable connector cable tie-down. See Figure 36, item 3.

4. Disconnect the thermistor cable connector. See Figure 36, item 3.

5. Disconnect the ribbon cable connector. See Figure 36, item 4.

6. Remove the four screws holding the universal PCB onto the front cover assembly. See Figure 37.

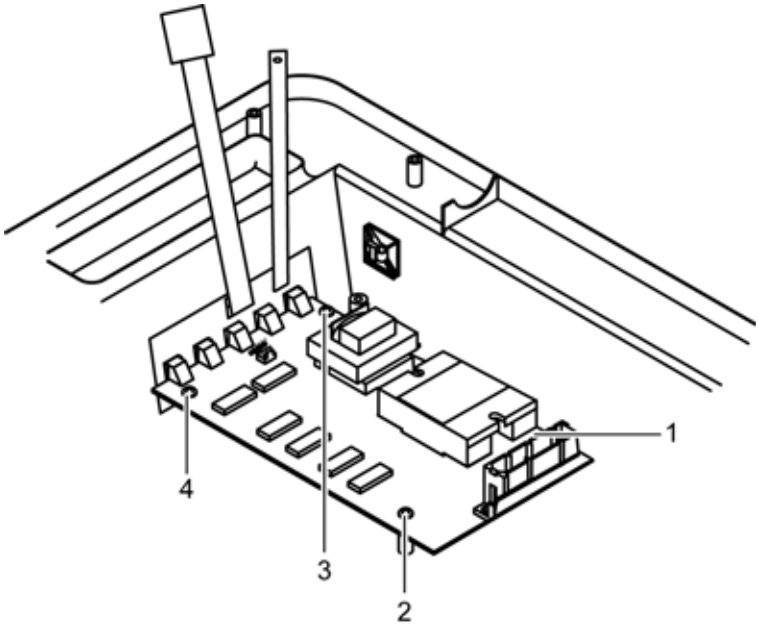


Figure 37: Universal PCB Screws

7. Carefully lift the universal PCB out of the front cover assembly.

8. Remove the solid state relay assembly from the removed universal PCB. See Figure 38, item 1.

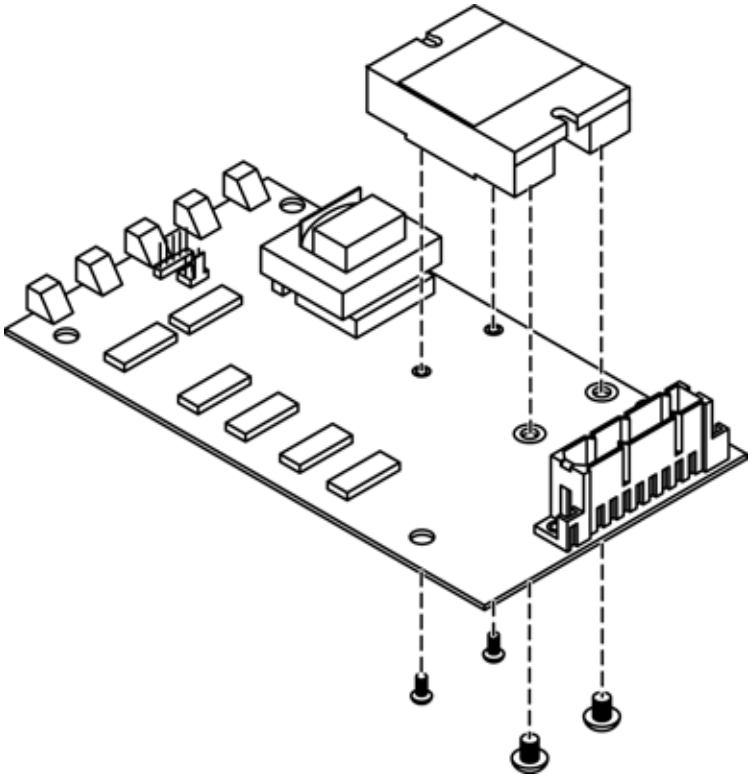
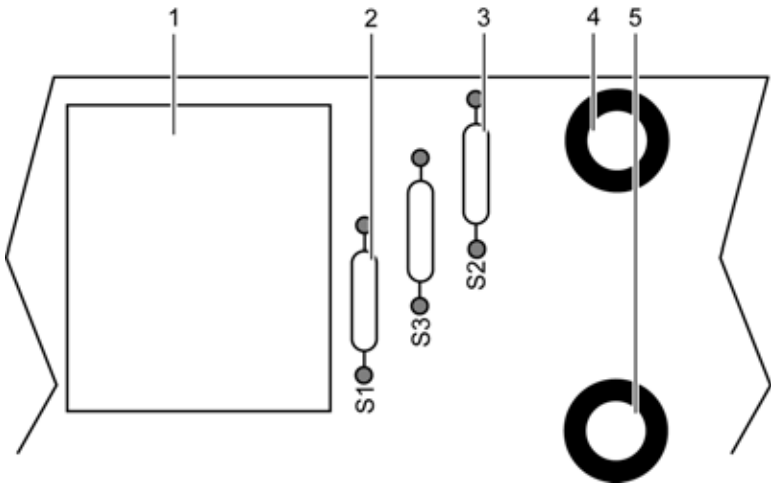


Figure 38: Universal PCB Solid State Relay Assembly

9. Cut and remove transformer voltage selection jumpers S1 and S3 on the replacement universal PCB. See Figure 39, items 2 and 3.

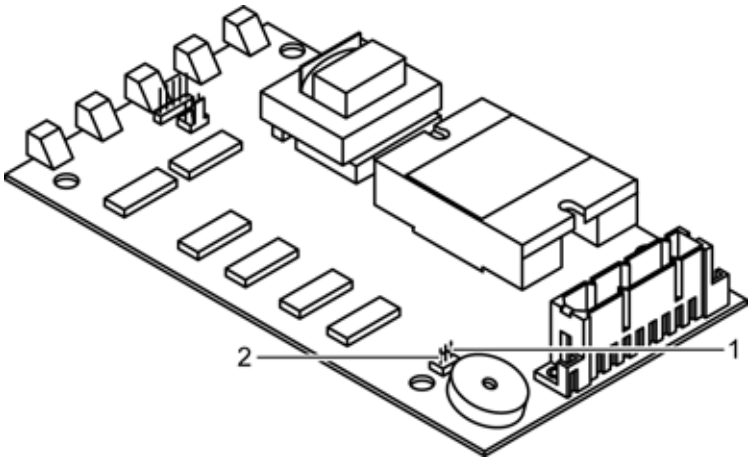


1 — Transformer T1	4 — Relay Mounting Hole
2 — Transformer Jumper S1	5 — Relay Mounting Hole
3 — Transformer Jumper S2	

Figure 39: Part of Universal PCB

10. Install the removed solid state relay assembly onto the replacement universal PCB. The small screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). The larger screws should be torqued to 17 in./lbs to 20 in./lbs (43 cm/kg to 51 cm/kg). See Figure 38.

11. Ensure the alarm jumper is connected between connector J4, pins 2 and 3. See Figure 40.



1 — J4, Pin-1	2 — J4, Pin-3

Figure 40: Universal PCB Alarm Jumper

Caution: Carefully align the five lights on the universal PCB with the control panel key pad push buttons. Failure to do so could damage the key pad or the universal PCB lights. See Figure 41.

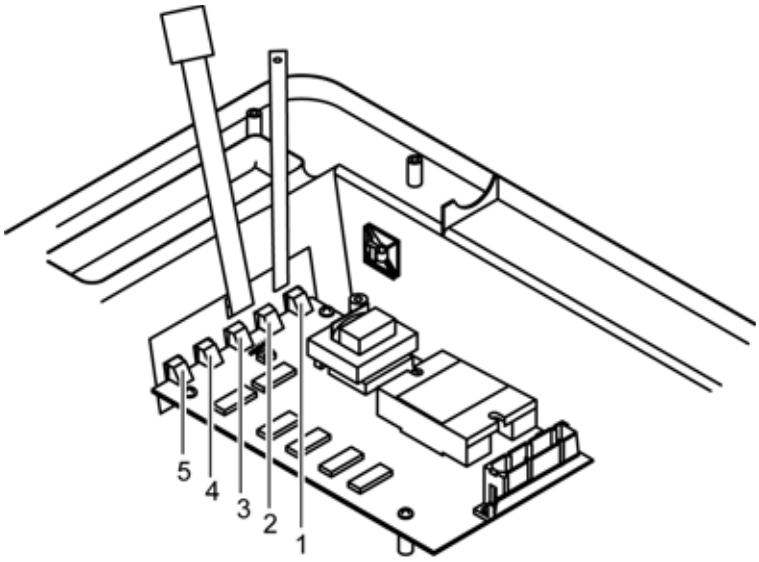


Figure 41: Universal PCB Lights

12. Carefully place the replacement universal PCB into the front cover assembly and install the four mounting screws. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 42.

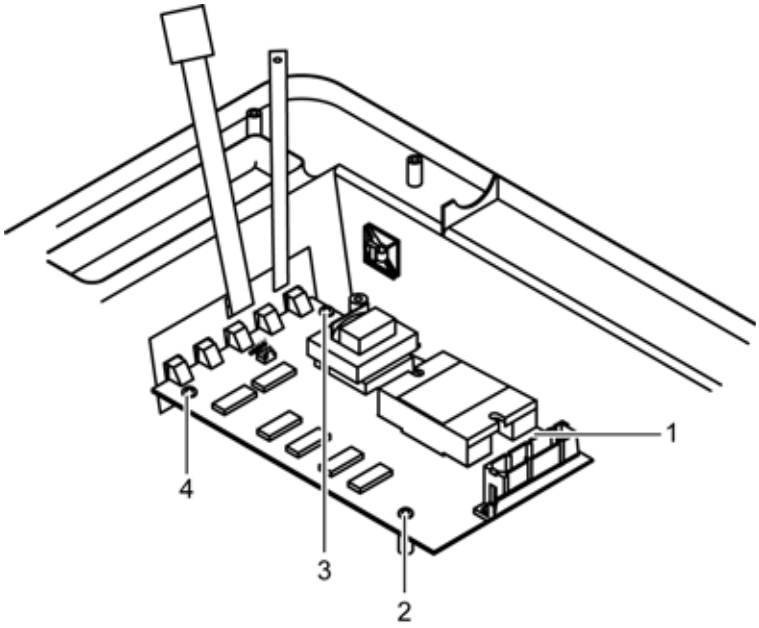


Figure 42: Universal PCB Screws

13. Connect the ribbon cable connector. See Figure 43, item 4.

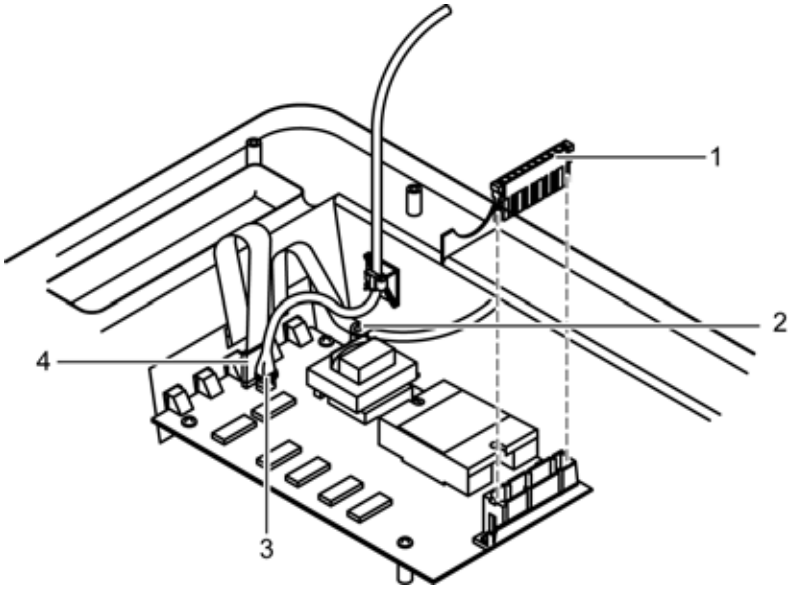


Figure 43: Cable Connections

14. Connect the thermistor cable connector. See Figure 43, item 3.

15. Attach a cable tie-down around the thermistor cable connector and the universal PCB connector. See Figure 43, item 3.

16. Connect the 9-pin connector to the universal PCB. See Figure 43, item 1.

17. Install the cable harness cable tie-down. See Figure 44, item 1.

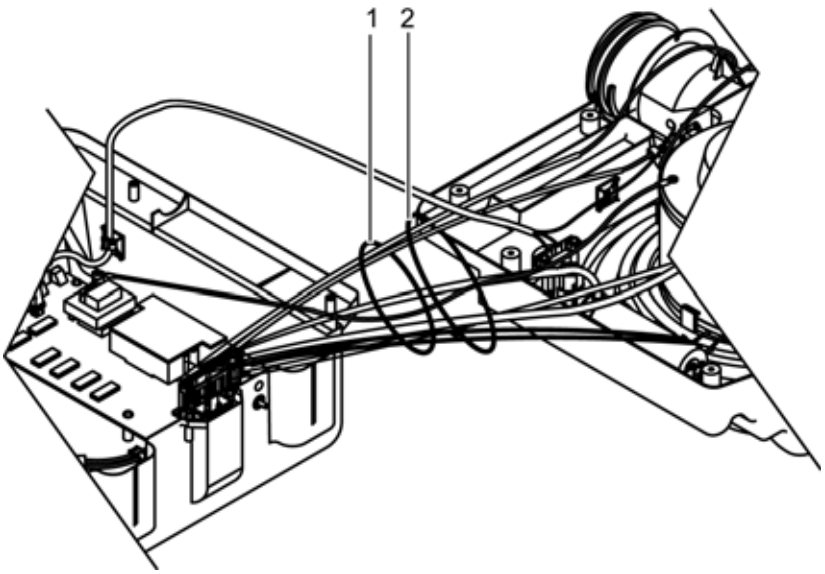


Figure 44: Cable Harness Cable Ties-downs

Caution: Ensure that the cable harness between the two cover halves is not pinched by the covers when joining the front and rear cover assemblies.

18. Carefully align the front and rear cover assemblies and install the seven screws. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 45.

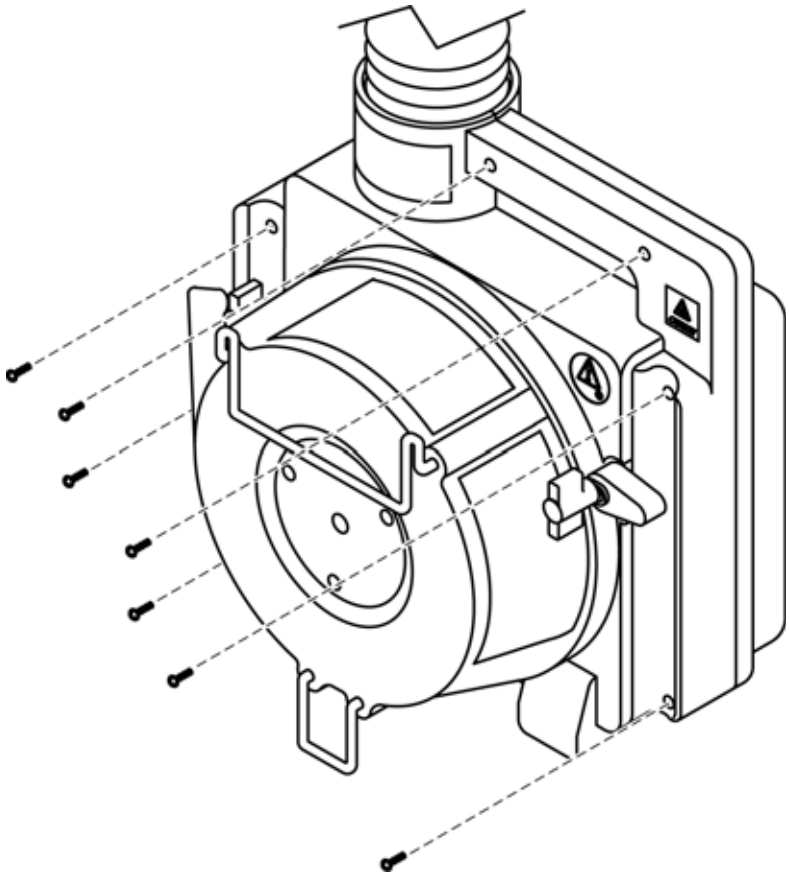


Figure 45: Cover Screw Locations

19. Attach the AC power cord to the warming unit.

20. Install the power cord retaining bracket (Figure 46, item 2), by tightening the bracket screws (item 1).

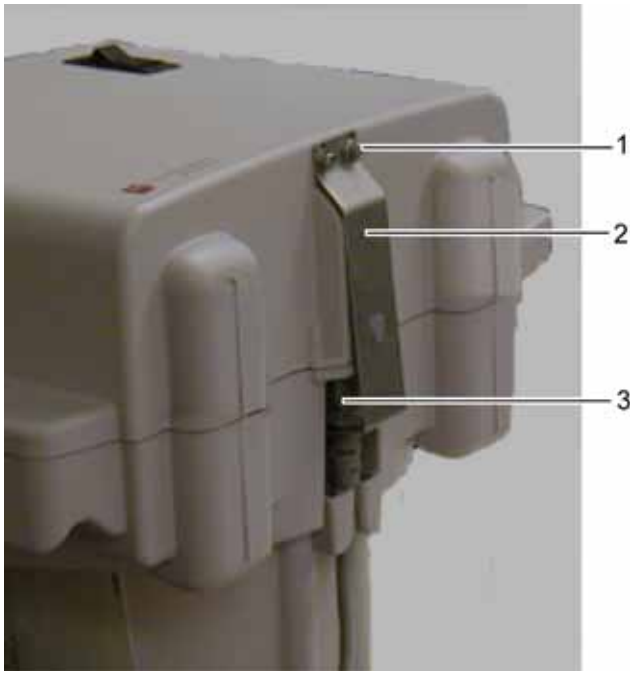


Figure 46: Power Cord Retaining Bracket

21. Perform the following checks/test to verify proper operation of the warming unit prior to returning the warming unit into service:

    - *Thermostat Protection Check* on page 17
    - *Output Temperature Check* on page 20
    - *Safety Tests* on page 22

Heater Assembly Replacement

The replacement heater assembly comes assembled with:

- 1 — heater, 230 volt
- 2 — pins, 16 - 18 GA, 13 A

The tools required for this procedure are:

Tool	Parameter/Use
Phillips screwdriver	#2
Wire cutter	Cut cable tie-downs

Tool (Continued)	Parameter/Use (Continued)
Socket	10 mm
Contact removal tool	AMP 305783 or equivalent
Torque driver/ wrench	4 in./lbs to 12 in./lbs (10 cm/kg to 30 cm/kg)
	36 in./lbs/44 in./lbs (91 cm/kg to 112 cm/kg)

Use the following procedure to replace the heater assembly.

1. Remove the filter cover assembly from the rear cover assembly. See *Filter Cover Assembly Replacement* on page 23.

2. Remove the filter assembly from the rear cover assembly. See Figure 47, item 1.

Figure 47: Filter Removal

3. Separate the front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

Note: The blower assembly is held onto the rear cover assembly by four screws and four clips. It is easier for two people to release the clips and lift the blower assembly from the rear cover assembly.

4. Remove the four screws holding the blower assembly to the rear cover assembly. See Figure 48.

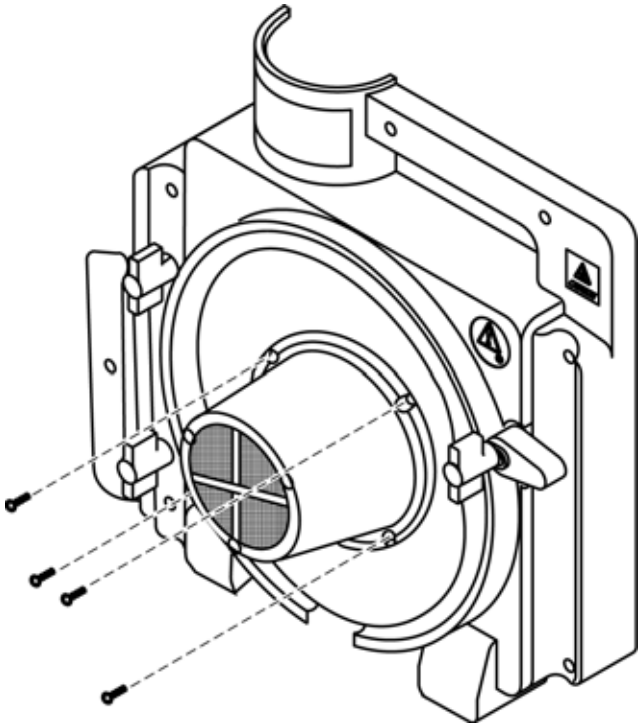


Figure 48: Blower Assembly Screws

5. Separate the warming unit front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

6. Cut the cable harness cable tie-down. See Figure 49, items 1 and 2.

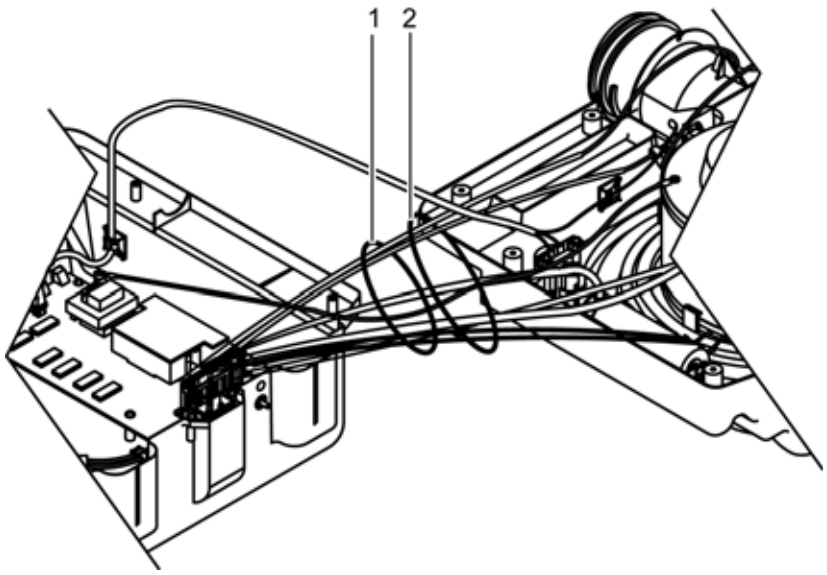
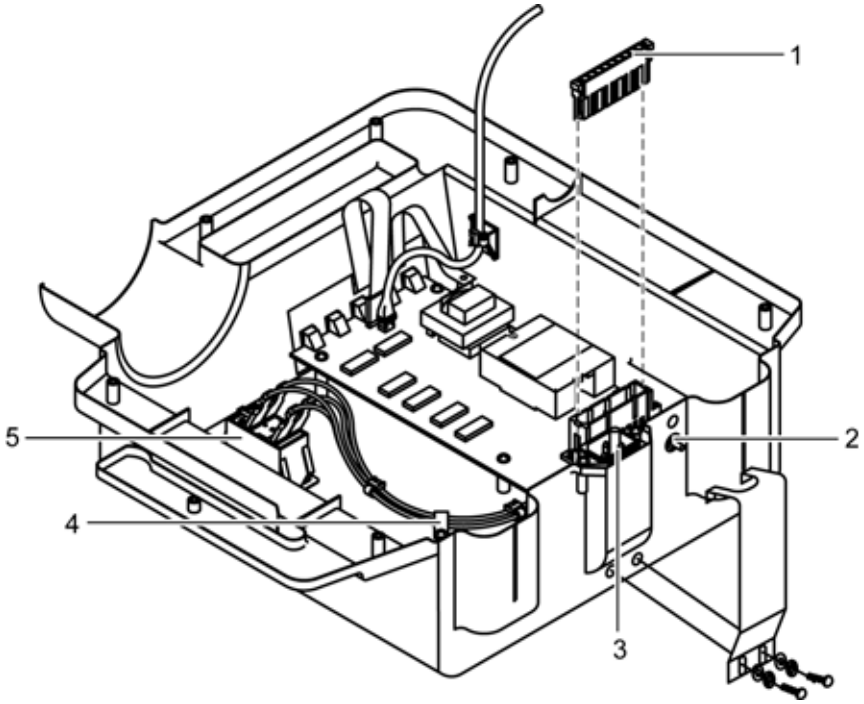


Figure 49: Cable Harness Cable Ties-downs

7. Disconnect the 9-pin connector from the universal PCB. See Figure 50, item 1.



1 — 9-pin connector	4 — Cable tie-down
2 — Equipotential ground terminal	5 — Power switch
3 — AC power connector	

Figure 50: Front Cover Assembly

8. Disconnect the equipotential ground stud wires. See Figure 50, item 2.

9. Remove the AC power connector from the front cover assembly. See Figure 50, item 3.

10. Remove the cable tie-down from the front cover assembly. See Figure 50, item 4.

Note: Write down the color code of each wire connected to the power switch. This will ensure that the wires will be reconnected properly.

11. Disconnect the four wires from the power switch. See Figure 50, item 5.

12. Cut the cable tie. See Figure 51, item 1.

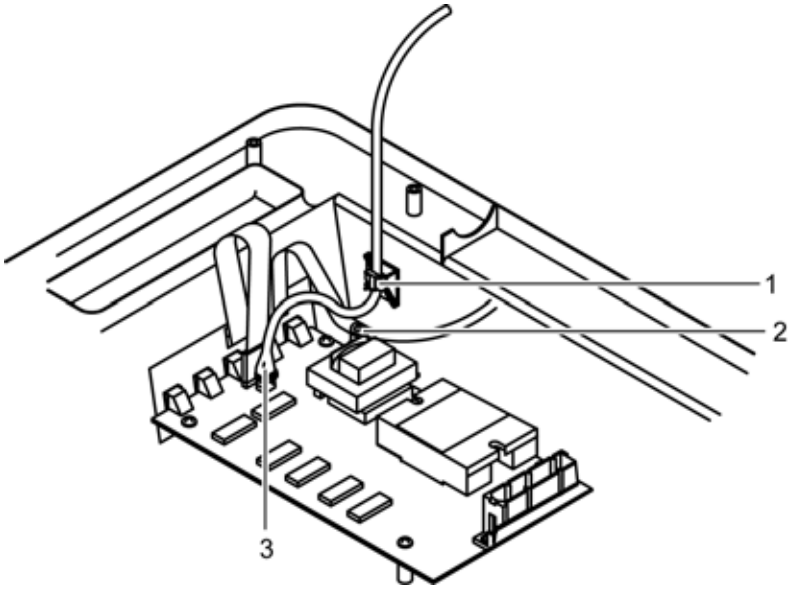


Figure 51: Cable Disconnect

13. Remove the ground screw. See Figure 51, item 2.

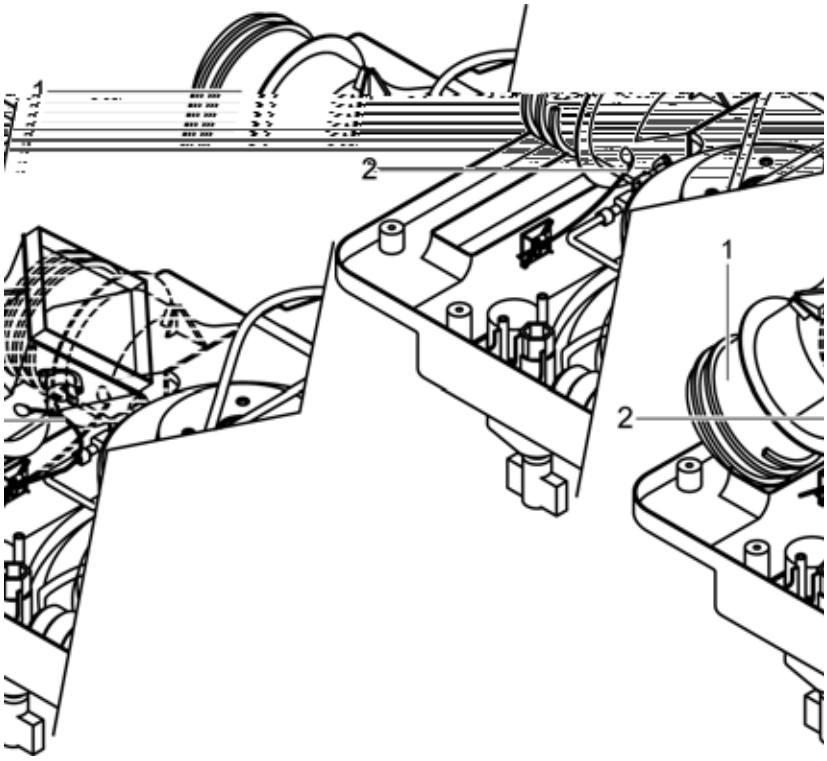
14. Cut the cable tie-down from the thermistor cable connector. See Figure 51, item 3.

15. Disconnect the thermistor cable connector. See Figure 51, item 3.

16. Place the front cover assembly in a safe place.

Caution: Care must be taken when moving the duct adapter. The thermistor connection to the duct adaptor is fragile and will become disconnected if too much pressure is applied to it.

17. Carefully lift the duct adapter and lay the duct adapter on the rear cover handle. See Figure 52.



1 — Duct adapter	2 — Thermistor connection

Figure 52: Duct Adapter Placement

18. Rotate the blower motor assembly clockwise to disengage two of the four clips. See Figure 53 and Figure 54.

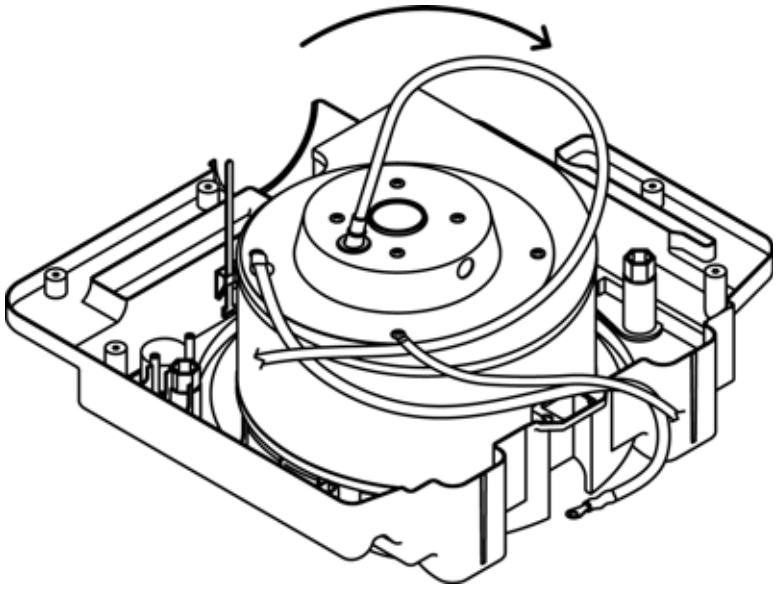


Figure 53: Blower Motor Removal

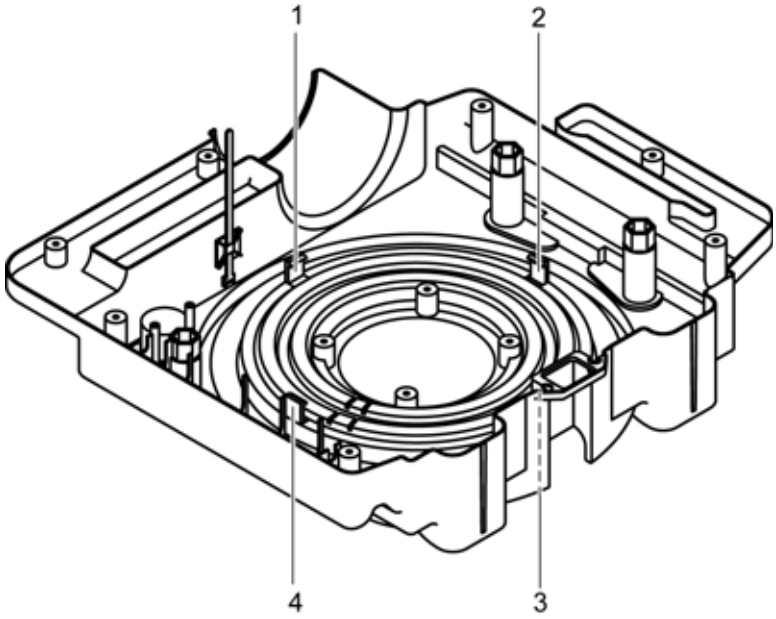


Figure 54: Blower Assembly Clips

19. Slide the blower motor assembly away from the engaged clips to disengage the last two clips.

20. Lay the blower motor assembly beside the rear cover assembly. Do not over stress the wires.

21. Remove the rubber washer from the rear cover assembly. See Figure 55, item 1.

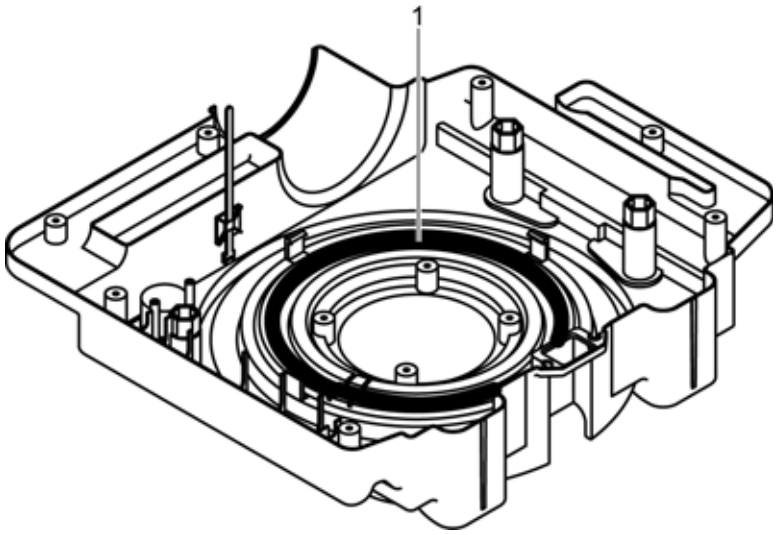


Figure 55: Rubber Washer

Caution: Do not touch the heater coil. Oil from your fingers may cause damage to the heater coil when it is in use.

22. Lift the heater assembly out of the rear cover assembly. See Figure 56, item 1.

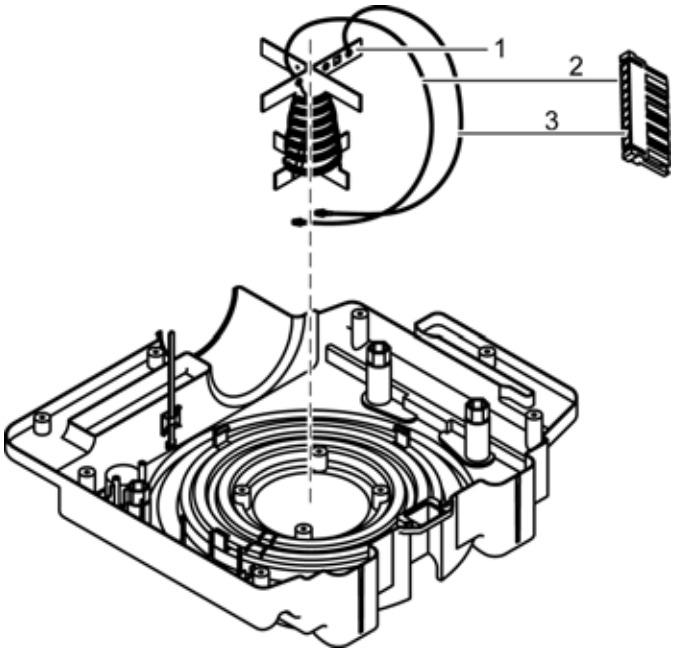


Figure 56: Heater Assembly

Note: For the next four steps, use an AMP 305183 contact removal tool or equivalent.

23. Remove the heater black wire and pin from pin-2 of the 9-pin connector. See Figure 56, item 3.

24. Remove the heater red wire (may be white in some assemblies) and pin from pin-8 of the 9-pin connector. See Figure 56, item 2.

25. Install the new heater red wire and pin into pin-8 of the 9-pin connector. See Figure 56, item 2.

26. Install the new heater black wire and pin into pin-2 of the 9-pin connector. See Figure 56, item 3.

Note: Ensure that the heater thermostat (Figure 57, item 3) is at the top of the heater when the heater is installed in the rear cover assembly.

27. Slide the new heater into the rear cover assembly. See Figure 57, item 1.

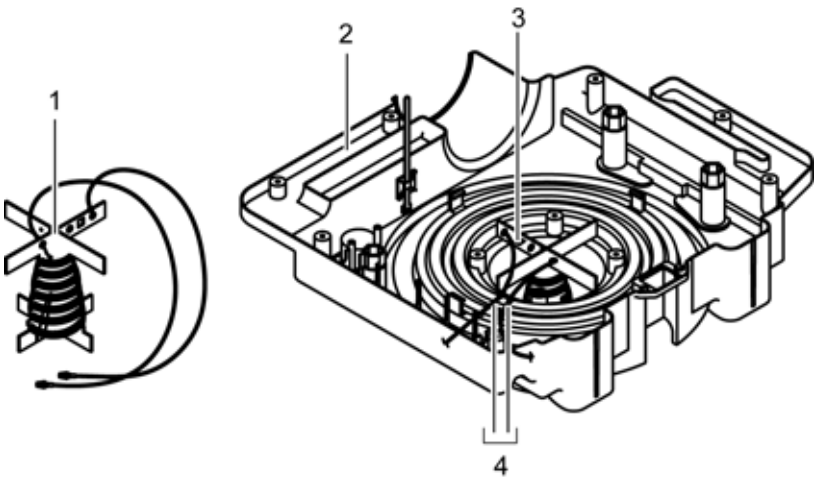


Figure 57: Heater Assembly Installation

28. Orient the heater with the heater thermostat (item 3) is nearest the rear cover assembly handle (item 2). See Figure 57.

29. Route heater black and red wires through the cut-outs in the rear cover assembly. See Figure 57, item 4.

30. Place the rubber washer into the rear cover assembly with the wire indentations over the heater wires. See Figure 58, item 1.

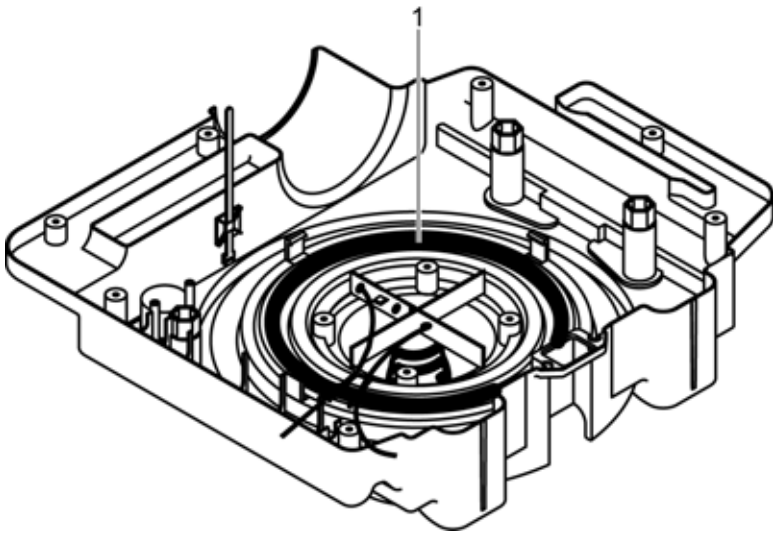


Figure 58: Rubber Washer

31. Place the blower assembly into the rear cover assembly and ensure that the four blower assembly clips attach over the edges of the blower assembly. See Figure 59.

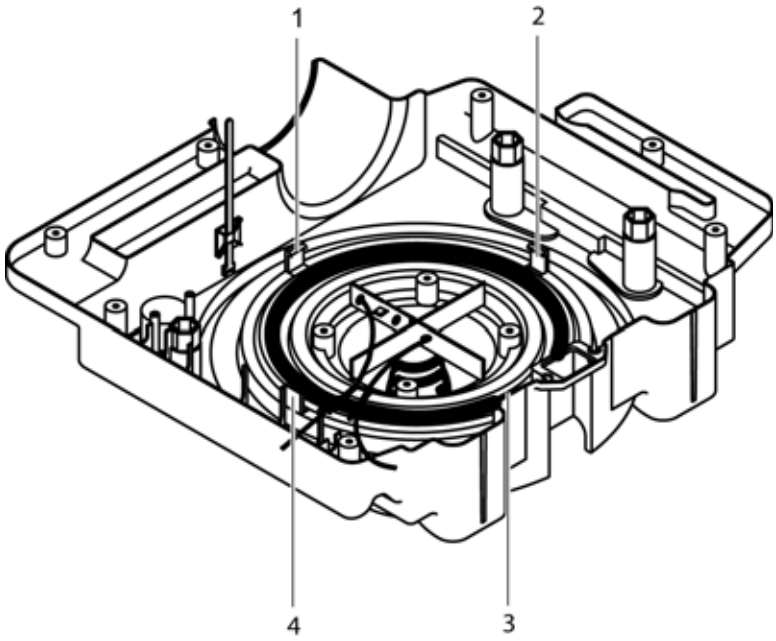


Figure 59: Blower Assembly Clips

32. Install the four blower assembly mounting screws into the rear cover assembly. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 60.

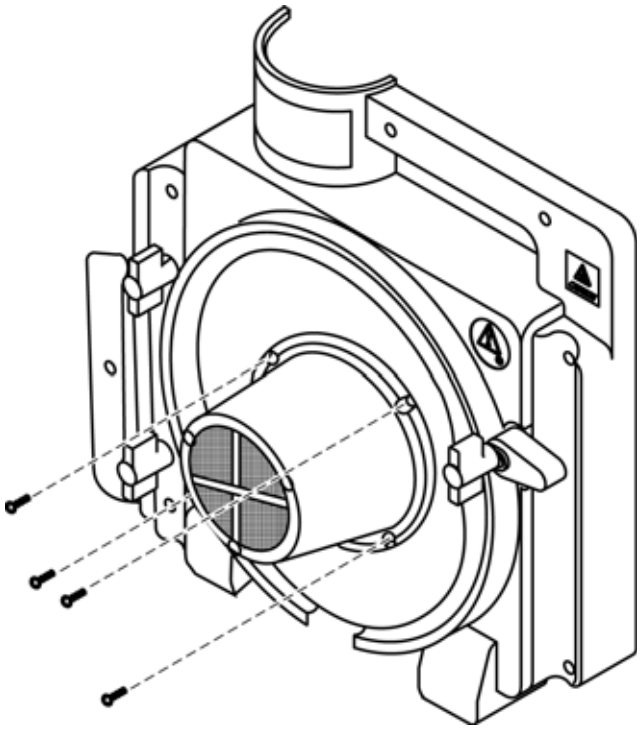
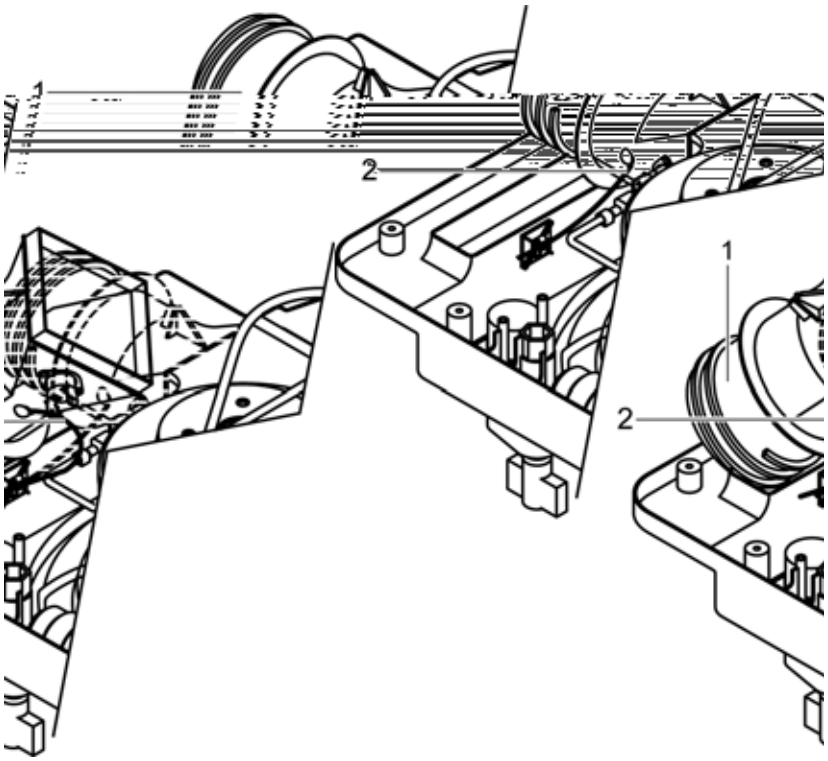


Figure 60: Blower Assembly Screws

Caution: Care must be taken when moving the duct adapter. The thermistor connection to the duct adaptor is fragile and will become disconnected if too much pressure is applied to it.

33. Carefully insert the duct adapter into the blower assembly. See Figure 61.



1 — Duct adapter	2 — Thermistor connection

Figure 61: Duct Adapter Placement

34. Connect the thermistor cable to the universal PCB assembly. See Figure 62, item 3.

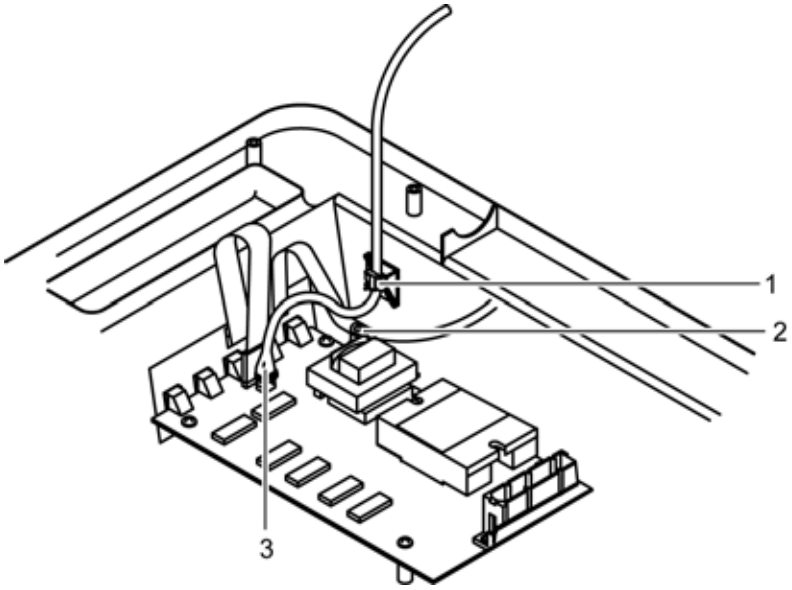


Figure 62: Cable Connections

35. Install the cable tie around the thermistor cable. See Figure 62, item 1.

36. Connect the key pad ground strap and the blower ground wire. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 62. item 2.

37. Connect the four wires to the power switch. See Figure 63, item 5.

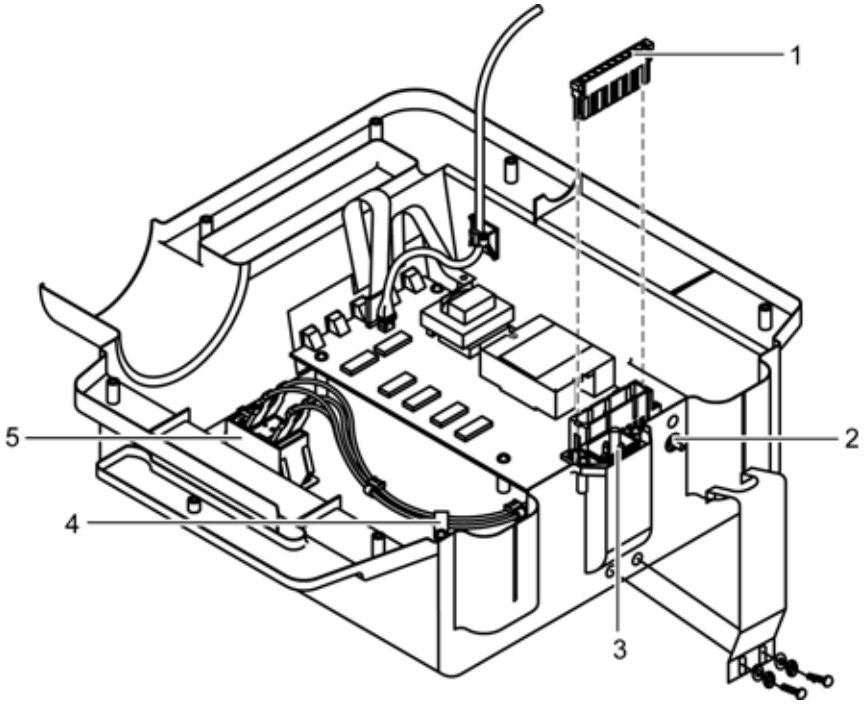
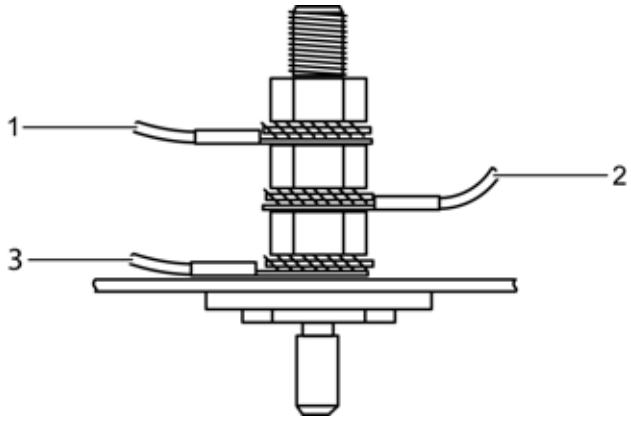


Figure 63: Front Cover Assembly

38. Install the tie-down around the four power switch wires. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 63, item 4.

39. Install the AC power connector into the front cover assembly. The screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 63, item 3.

40. Connect the ground wires to the equipotential ground stud (Figure 63, item 2). The nuts should be torqued to 36 in./lbs to 44 in./lbs (91 cm/kg to 112 cm/kg). See Figure 64.



1 — Blower Housing Ground
2 — Blower Motor Ground
3 — AC Power Connector Ground

Figure 64: Equipotential Ground Stud Wiring

41. Connect the 9-pin connector to the universal PCB. See Figure 63, item 1.

42. Install the cable harness cable tie-down. See Figure 65, items 1 and 2.

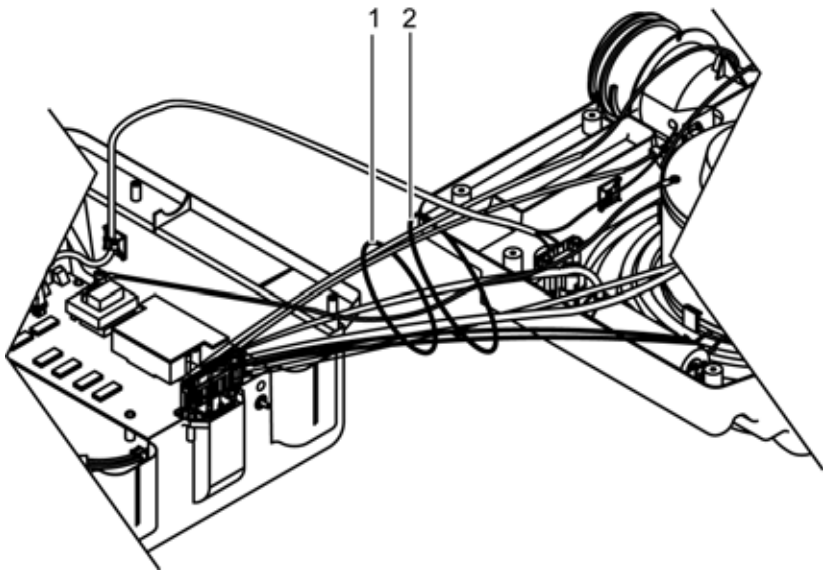


Figure 65: Cable Harness Cable Ties-downs

Caution: When placing the front and rear cover assemblies together ensure that the wires are not pinched between the covers.

43. Carefully place the front and rear cover assemblies together.

44. Install the seven screws into the rear cover assembly to attach it to the front cover assembly. The screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 66.

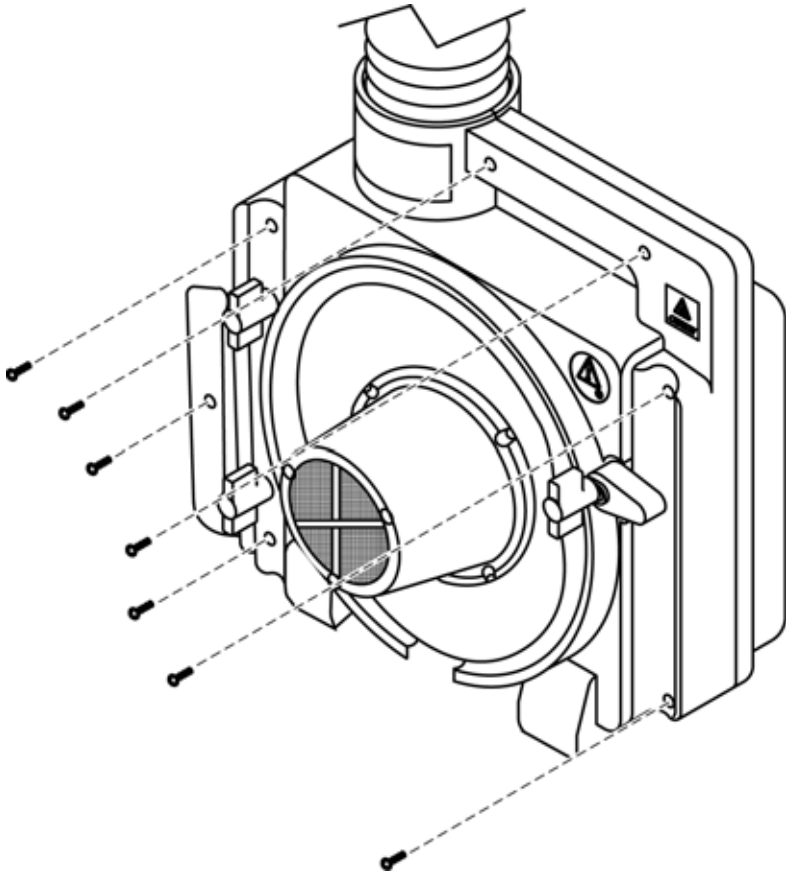


Figure 66: Cover Screw Locations

45. Place the filter assembly into the rear cover assembly. See Figure 67, item 1.

Figure 67: Filter Installation

46. Install the filter cover assembly on the rear cover assembly. The screws should be torqued to 8 in./lbs to 12 in./lbs (20 cm/kg to 30 cm/kg). See Figure 68.

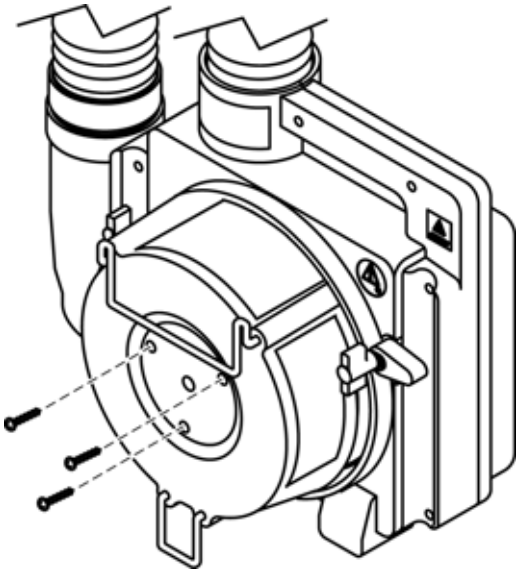


Figure 68: Filter Cover Installation

47. Attach The AC power cord to the warming unit.

48. Install the power cord retaining bracket (Figure 69, item 2), by tightening the bracket screws (item 1).

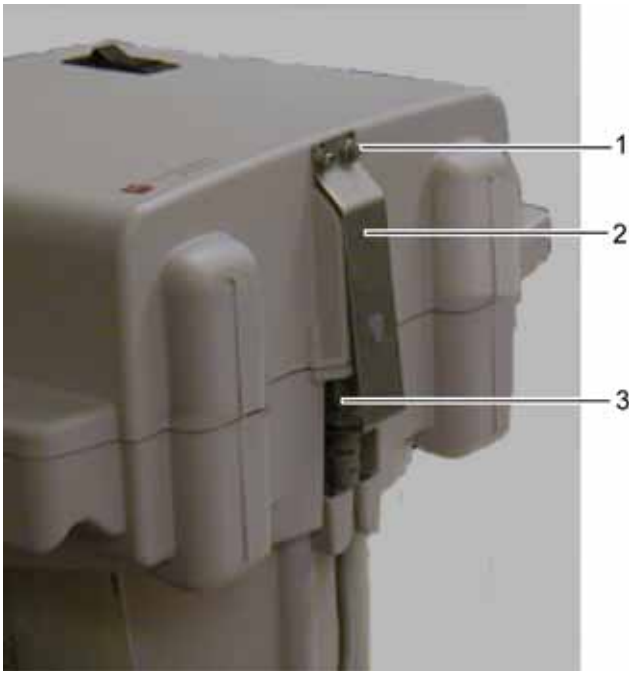


Figure 69: Power Cord Retaining Bracket

49. Perform the following checks/test to verify proper operation of the warming unit prior to returning the warming unit into service:

    - *Thermostat Protection Check* on page 17

- *Output Temperature Check* on page 20
- *Safety Tests* on page 22

Duct Adapter Assembly Replacement

The replacement duct adapter assembly come assembled with:

- 1 — duct adapter
- 1 — screen

The tools required for this procedure are:

Tool	Parameter/Use
Phillips screwdriver	#2
Wire cutter	Cut cable tie-downs
Knife	Removal of silicone RTV
Silicone RTV	Thermistor connection
Torque driver/wrench	7 in./lbs to 12 in./lbs (18 cm/kg to 30 cm/kg)

Use the following procedure to replace the duct adapter assembly.

1. Separate the warming unit front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

Caution: The thermistor is very delicate and easily damaged. Use extreme care when handling, removing, or replacing the thermistor.

2. Remove the silicone RTV from the thermistor connection on the duct adapter assembly. See Figure 70, item 1.

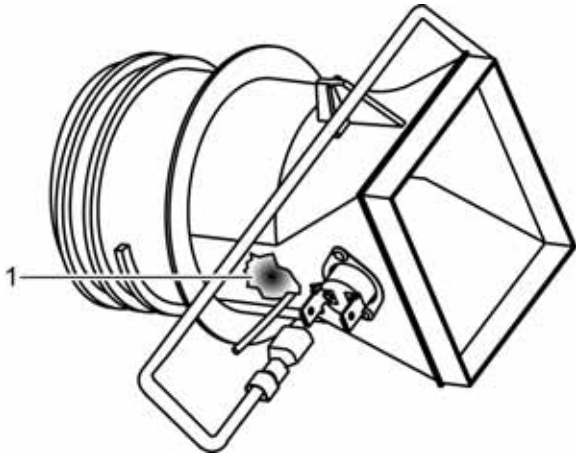


Figure 70: Thermistor Silicone

3. Carefully slide the thermistor out of the duct adapter assembly. See Figure 71, item 1.

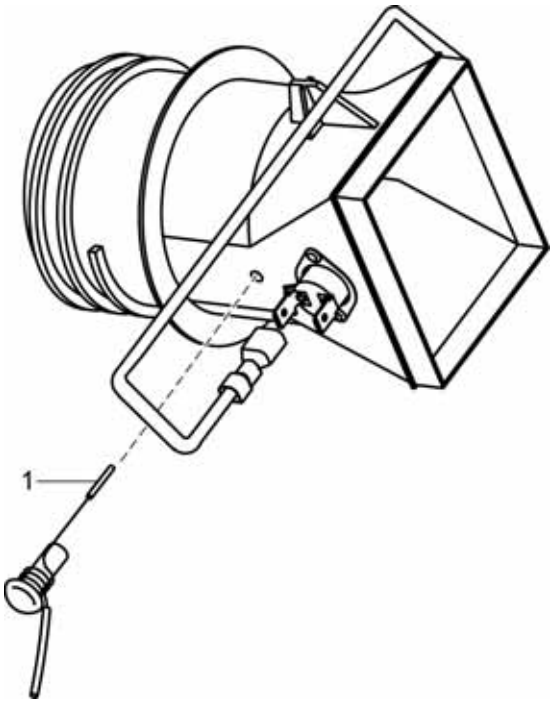


Figure 71: Thermistor Removal

4. Lift the duct adapter assembly out of the rear cover assembly. See Figure 72, item 1.

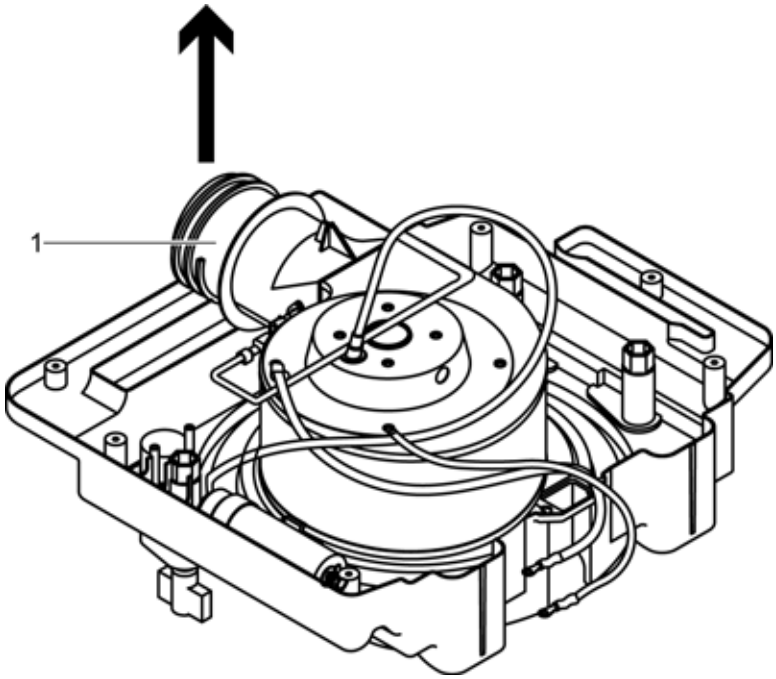


Figure 72: Duct Adapter Removal

5. Connect the three wires on the removed duct adapter onto the replacement duct adapter, ensuring the same connection points.

6. Slide the new duct adapter assembly into the blower housing. See Figure 73, item 1.

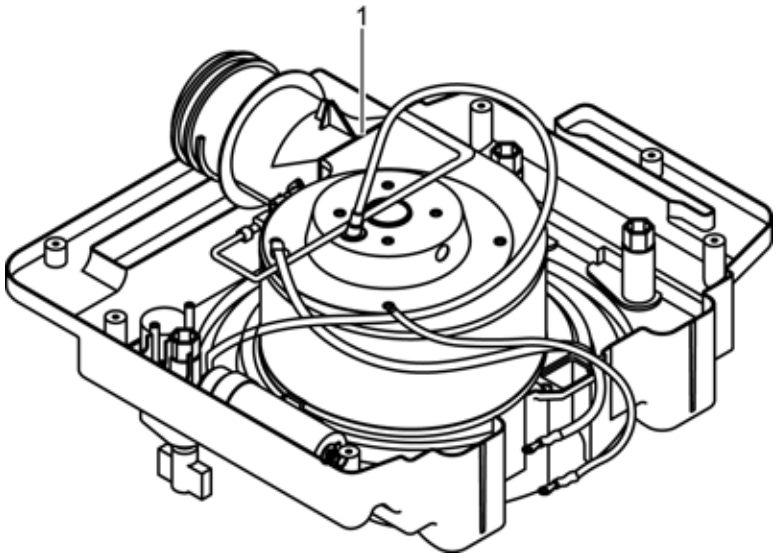


Figure 73: Duct Adapter Placement

Caution: The thermistor is very delicate and easily damaged. Use extreme care when handling, removing or replacing the thermistor.

7. Carefully insert the thermistor into the duct adapter assembly. See Figure 71, item 1.

8. The thermistor (item 1) should be positioned as shown in Figure 74.

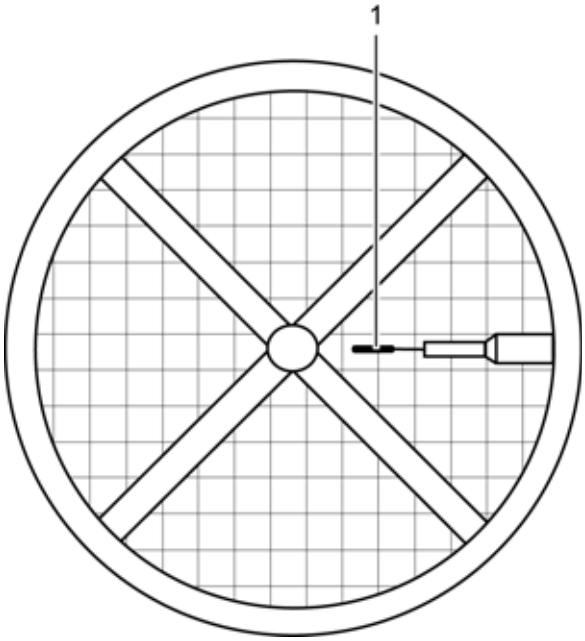


Figure 74: Thermistor Position Within Duct Adapter

9. Apply a small amount of silicone RTV to the thermistor rivet cap and the adapter housing. See Figure 70.

Caution: When placing the front and rear cover assemblies together ensure that the wires are not pinched between the covers.

10. Carefully align the front and rear cover assemblies and install the seven screws. The screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 75.

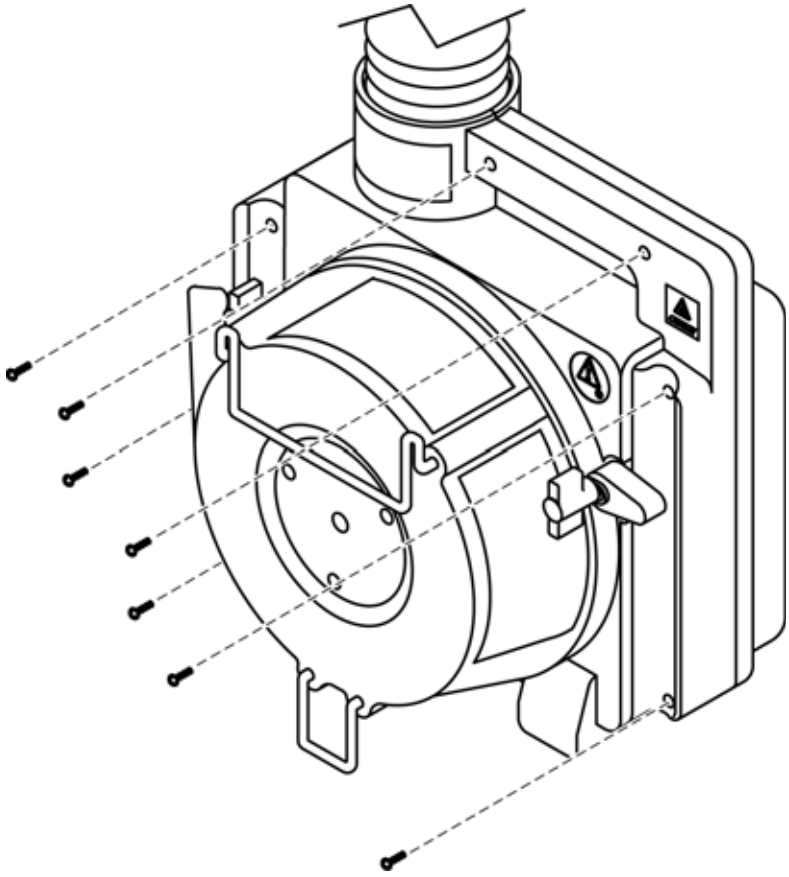


Figure 75: Cover Screw Locations

11. Attach the AC power cord to the warming unit.

12. Perform the following checks/test to verify proper operation of the warming unit prior to returning the warming unit into service:

    - *Thermostat Protection Check* on page 17
    - *Output Temperature Check* on page 20
    - *Safety Tests* on page 22

Rear Cover Assembly Replacement

The replacement rear cover assembly comes assembled with:

- 1 — rear enclosure
- 1 — cable tie mount
- 1 — cable tie
- 3 — lag bolts, 3¼ inches

- 1 — test cover
- 1 — screw
- 1 — heater cone insert
- 1 — heater screen
- 1 — attention label
- 1 — model/serial number label

The tools required for this procedure are:

Tool	Parameter/Use
Phillips screwdriver	#2
Wire cutter	Cut cable tie-downs
Socket	10 mm
Torque driver/wrench	4 in./lbs to 12 in./lbs (10 cm/kg to 30 cm/kg)
	36 in./lbs to 44 in./lbs (91 cm/kg to 112 cm/kg)

Use the following procedure to replace the rear cover assembly.

1. Unplug the warming system power cord from the AC outlet.
2. Place the warming system unit on a workbench with the bottom of the unit facing you.
3. Remove the filter cover assembly, see *Filter Cover Assembly Replacement* on page 23.
4. Separate the front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.
5. Slide the filter cover assembly from the warming unit.
6. Remove the filter assembly from the rear cover assembly. See Figure 76, item 1.

Figure 76: Filter Removal

7. Remove the three warming unit mounting clamps from the rear cover assembly. See Figure 77.

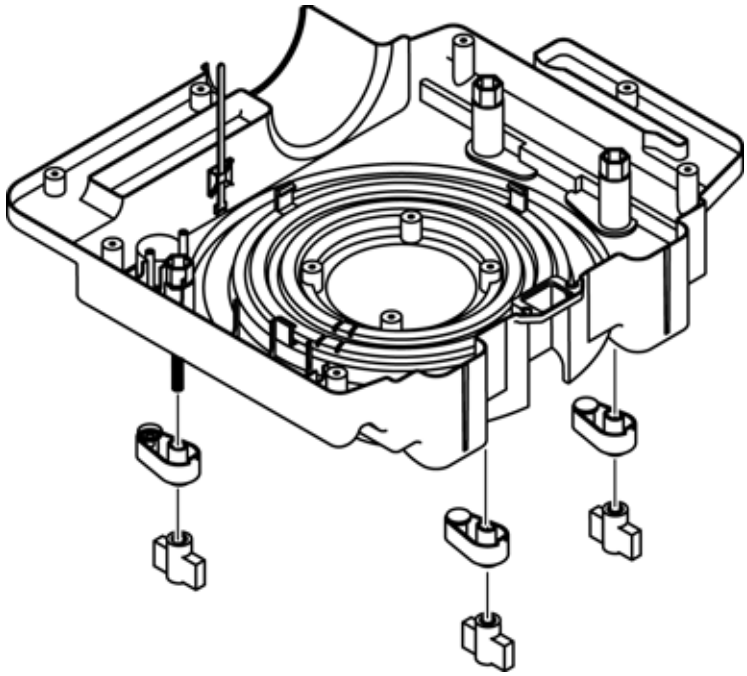


Figure 77: Warming Unit Mounting Clamps

Caution: Separate the front and rear covers very carefully. The wires connected between the covers are short and may be damaged if too much pressure is applied to them.

8. Separate the front and rear cover assemblies. See *Separating the Warming Unit Front and Rear Covers* on page 25.

9. Cut the two cable ties. See Figure 78, items 1 and 2.

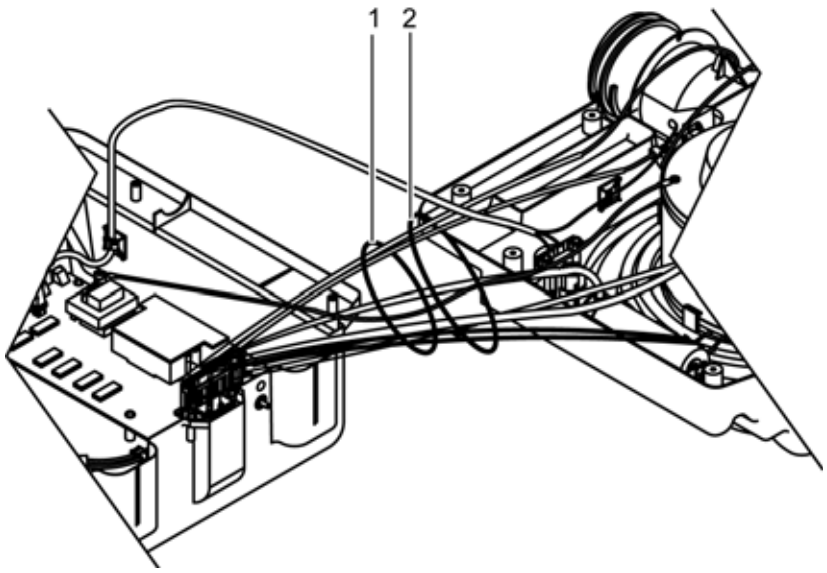
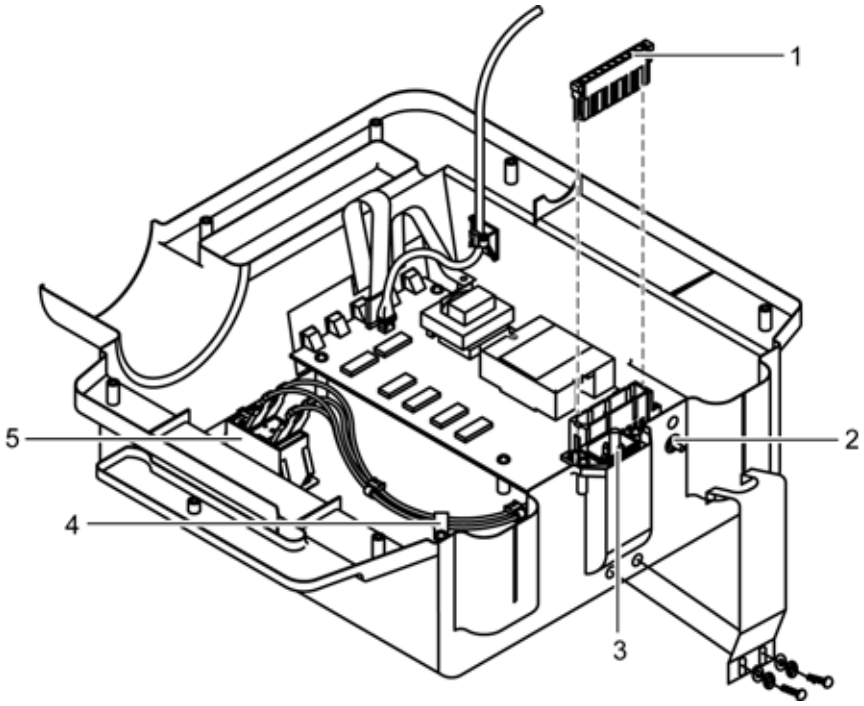


Figure 78: Separated Covers

10. Disconnect the 9-pin connector from the universal PCB. See Figure 79, item 1.



1 — 9-pin connector	4 — Cable tie-down
2 — Equipotential ground terminal	5 — Power switch
3 — AC power connector	

Figure 79: Front Cover Assembly

11. Disconnect the equipotential ground stud wires. See Figure 79, item 2.

12. Remove the AC power connector from the front cover assembly. See Figure 79, item 3.

13. Remove the cable tie-down from the front cover assembly. See Figure 79, item 4.

Note: Write down the color code of each wire connected to the power switch. This will ensure that the wires will be reconnected properly.

14. Disconnect the four wires from the power switch. See Figure 79, item 5.

15. Cut the cable tie. See Figure 80, item 1.

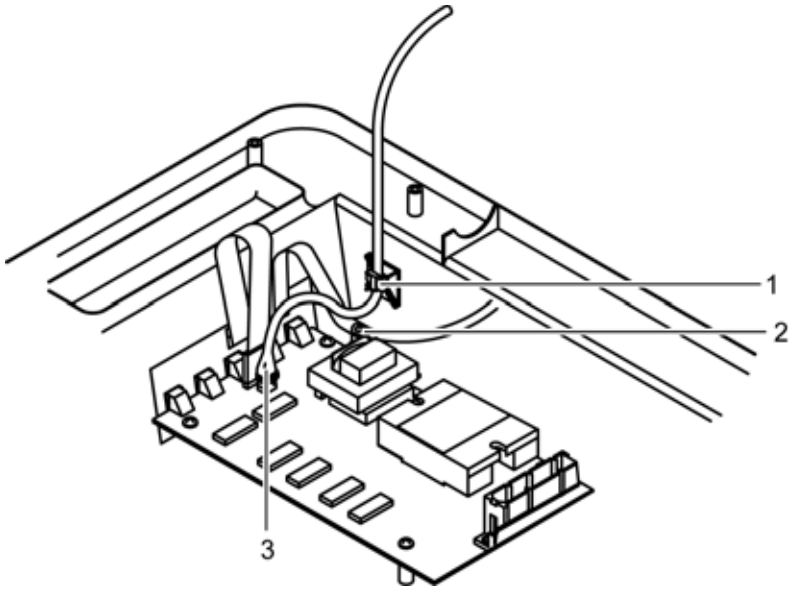


Figure 80: Cable Disconnect

16. Remove the ground screw. See Figure 80, item 2.

17. Cut the cable tie from the thermistor cable connector. See Figure 80, item 3.

18. Disconnect the thermistor cable connector. See Figure 80, item 3.

19. Place the front cover assembly in a safe place.

Caution: The thermistor is very delicate and easily damaged. Use extreme care when handling, removing or replacing the thermistor.

20. Remove the thermistor cable terminal board. See Figure 81, item 2.

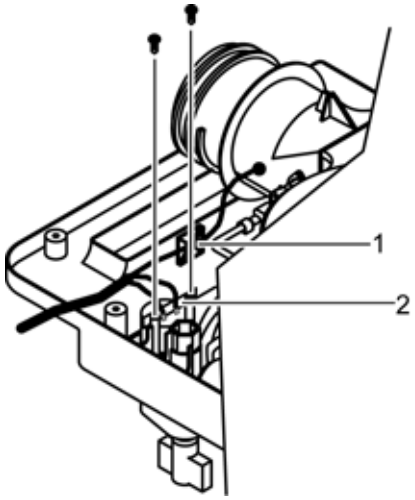


Figure 81: Thermistor Cable Removal

21. Cut the cable tie on the thermistor cable. See Figure 81, item 1.

Note: The blower assembly is held onto the rear cover assembly by four screws and four clips. It is easier for two people to release the clips and lift the blower assembly from the rear cover assembly.

22. Remove the four screws holding the blower assembly to the rear cover assembly. See Figure 82.

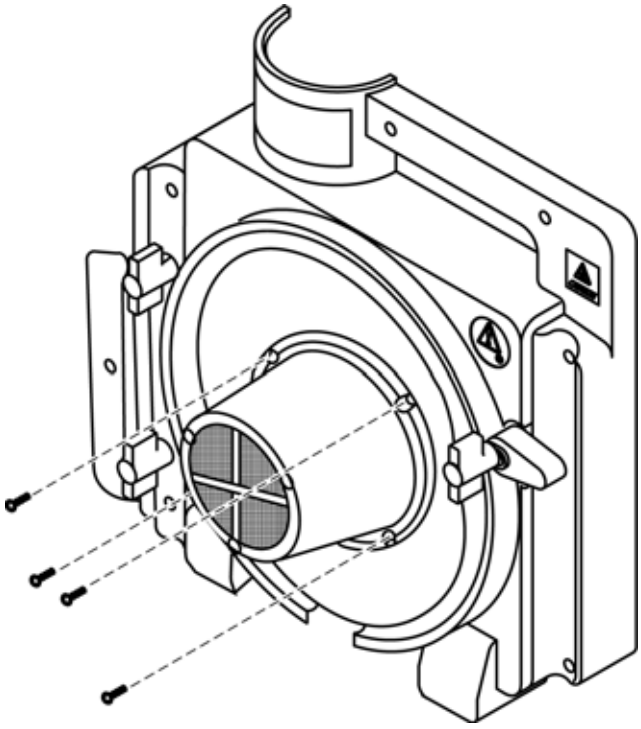


Figure 82: Blower Assembly Screws

23. Loosen the nut holding the capacitor to the rear cover assembly. See Figure 83, item 1.

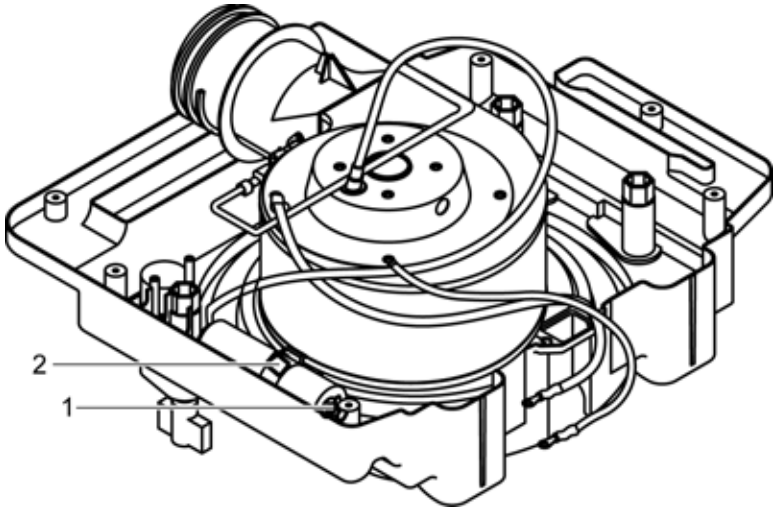


Figure 83: Blower Capacitor

24. Lift the capacitor free of the rear cover assembly.

25. Rotate the blower motor assembly clockwise to disengage two of the four clips. See Figure 84 and Figure 85.

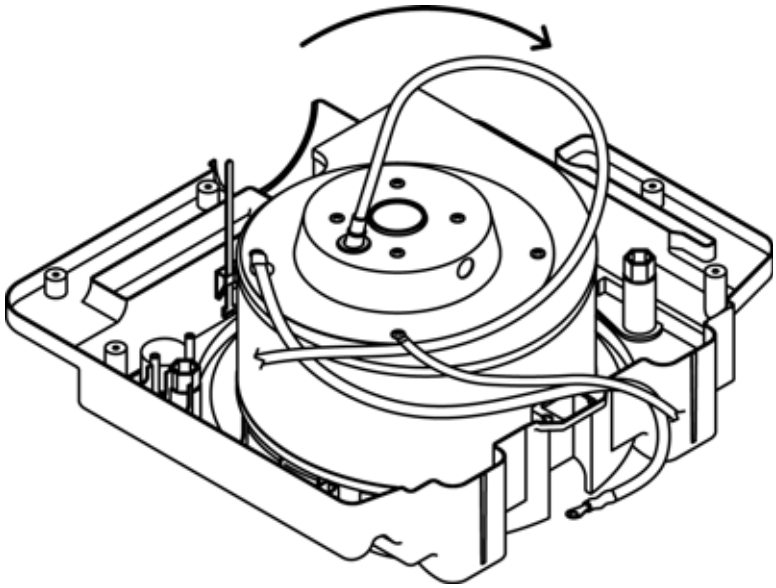


Figure 84: Blower Motor Removal

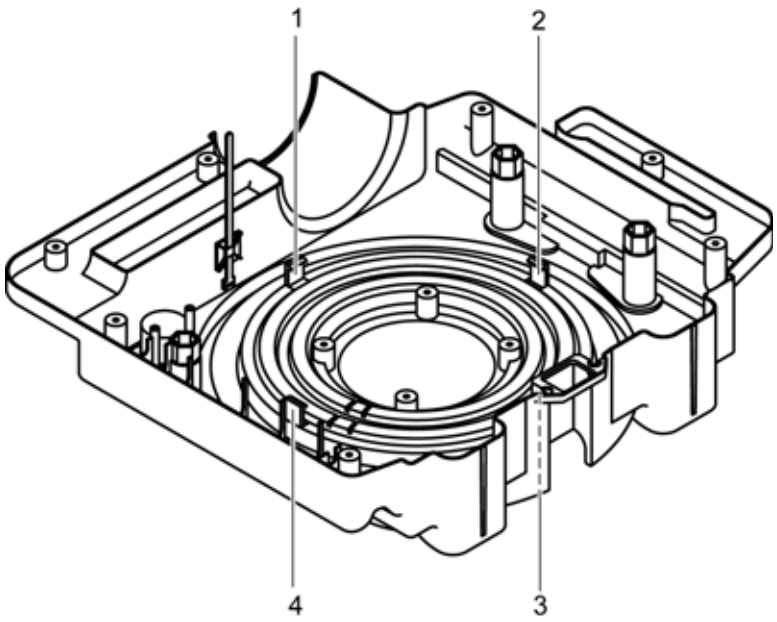


Figure 85: Blower Assembly Clips

26. Slide the blower motor assembly away from the engaged clips to disengage the last two clips.

27. Remove the rubber washer from the rear cover assembly. See Figure 86, item 1.

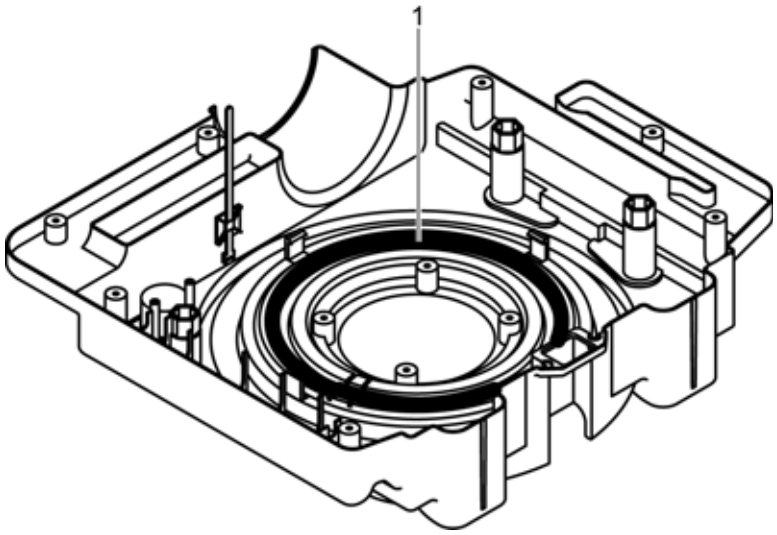


Figure 86: Rubber Washer

Caution: Do not touch the heater coil. Oil from your fingers may cause damage to the heater coil when it is in use.

28. Lift the heater assembly out of the rear cover assembly. See Figure 87, item 1.

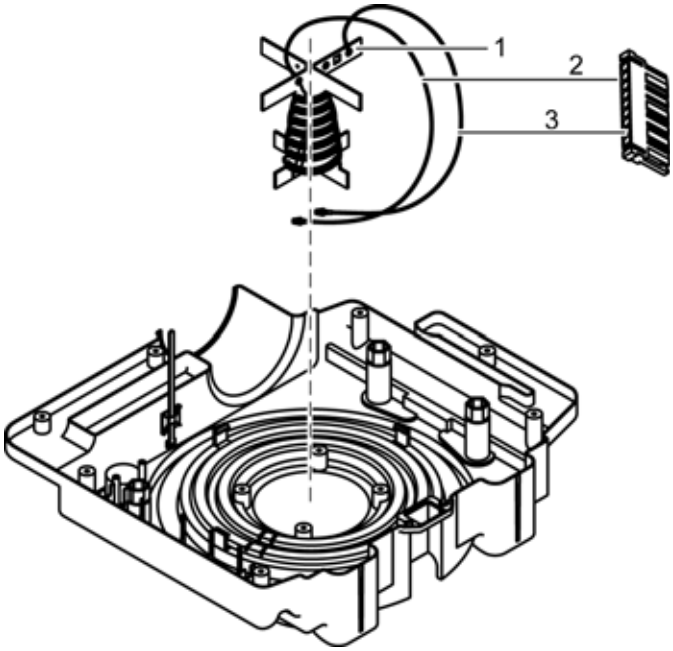


Figure 87: Heater Assembly

29. Discard the old rear cover assembly.

30. Install the three warming mounting brackets on the replacement rear cover assembly. See Figure 88.

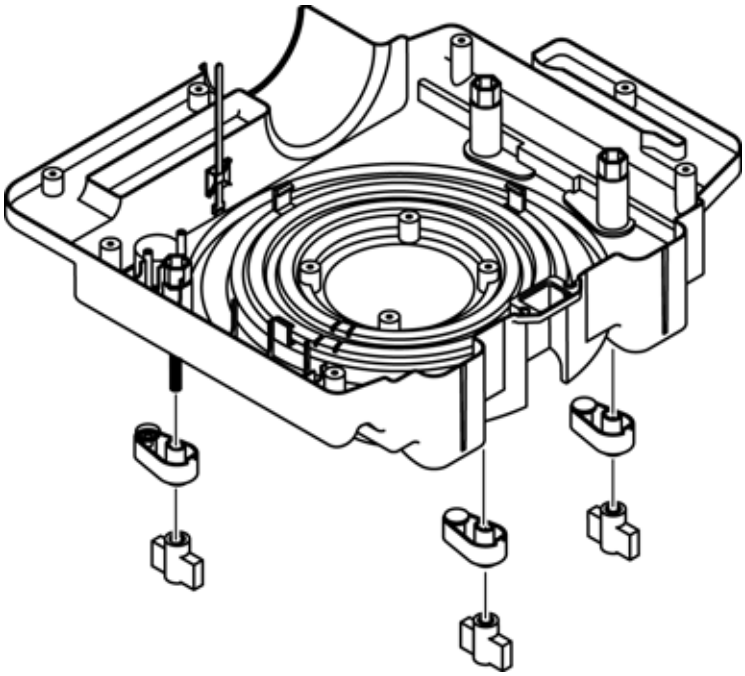


Figure 88: Warming Unit Mounting Brackets

Note: Ensure that the heater temperature sensor (Figure 89, item 1) is at the top of the heater when the heater is installed in the rear cover assembly.

31. Slide the heater into the replacement rear cover assembly. See Figure 89, item 2.

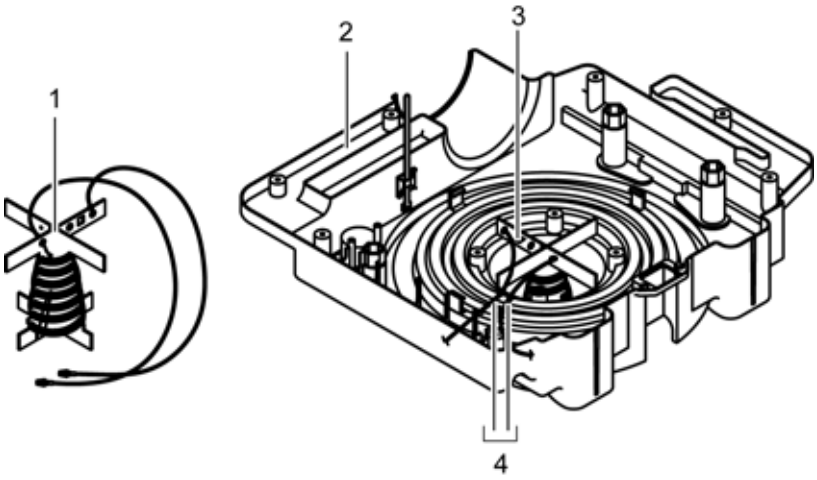


Figure 89: Heater Assembly Installation

32. Route heater black and red (in some units the wire is white, not red) wires through the cut-outs in the rear cover assembly. See Figure 89, item 3.

33. Place the rubber washer into the rear cover assembly with the wire indentations over the heater wires. See Figure 90, item 1.

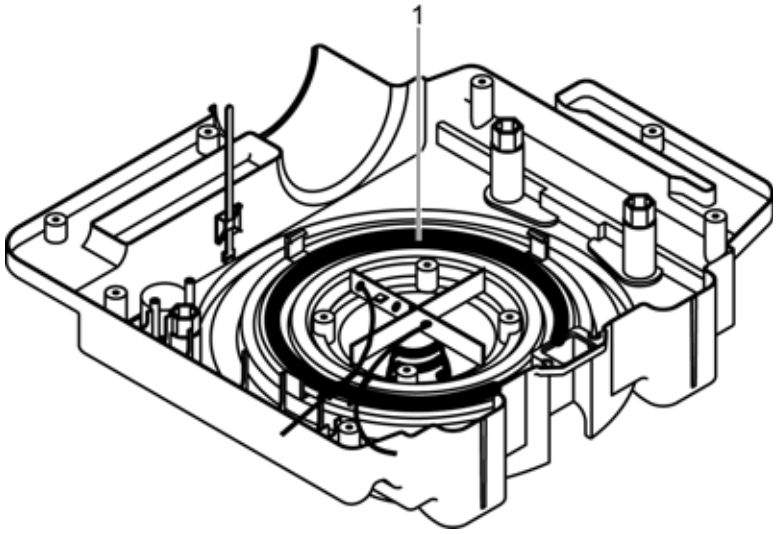


Figure 90: Rubber Washer

34. Place the blower assembly into the rear cover assembly and ensure that the four blower assembly clips attach over the edges of the blower assembly. See Figure 91.

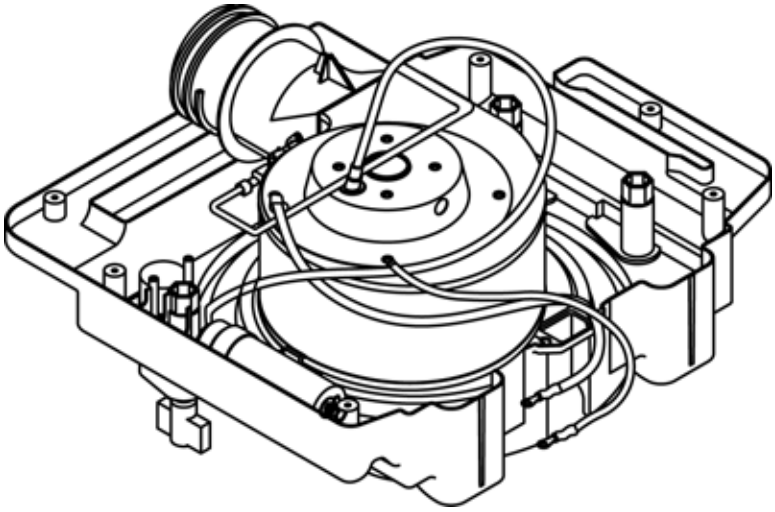


Figure 91: Blower Installation

35. Install the four blower assembly mounting screws into the rear cover assembly. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 92.

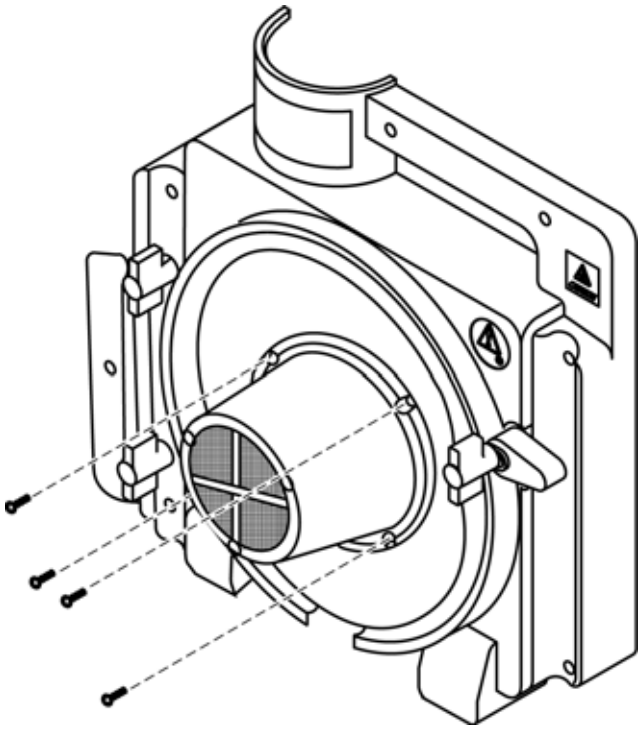


Figure 92: Blower Screws

36. Attach the cable tie around the thermistor cable. See Figure 93, item 1.

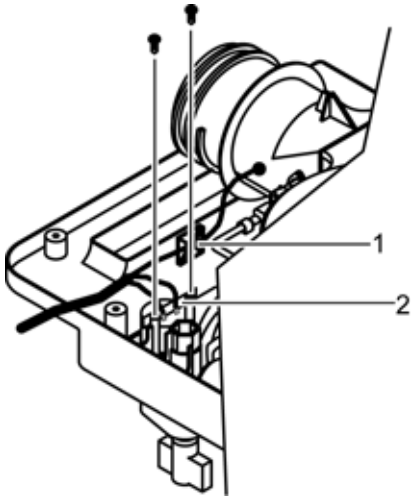


Figure 93: Thermistor Cable Installation

37. Install the thermistor cable terminal board. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 93, item 2.

Caution: Do not over tighten the capacitor nut. Over tightening the capacitor nut will cause the plastic rib to crack.

38. Install the capacitor in the rear cover assembly and tighten the nut. The nut should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 94, item 1.

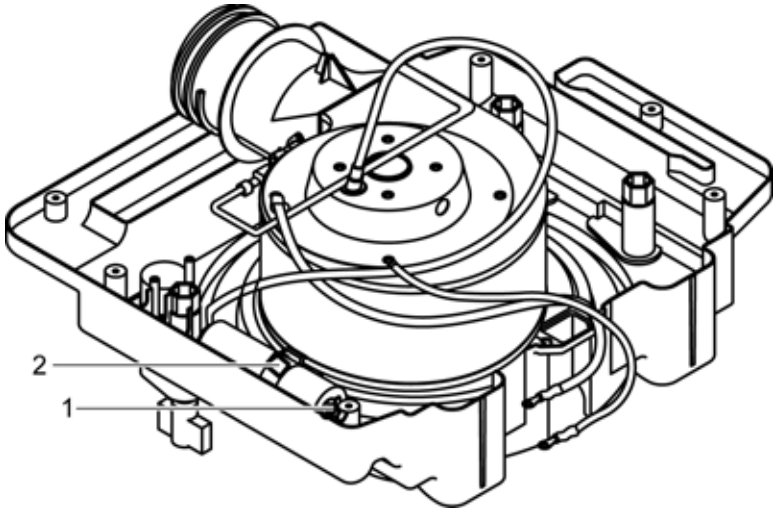


Figure 94: Capacitor Installation

39. Install the cable tie around the capacitor. See Figure 94, item 2.

40. Connect the thermistor cable to the universal PCB assembly. See Figure 95, item 3.

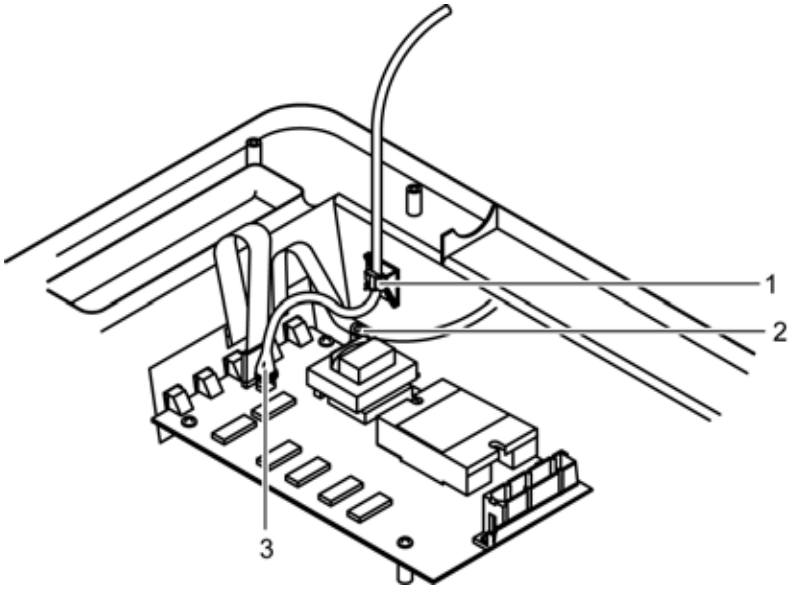


Figure 95: Cable Connections

41. Connect a cable tie-down around the thermistor cable connector. See Figure 95, item 3.

42. Connect the key pad ground strap and the blower ground wire. The screw should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 95, item 2.

43. Install the cable tie around the thermistor cable. See Figure 95, item 1.

44. Connect the four wires to the power switch. See Figure 96, item 5.

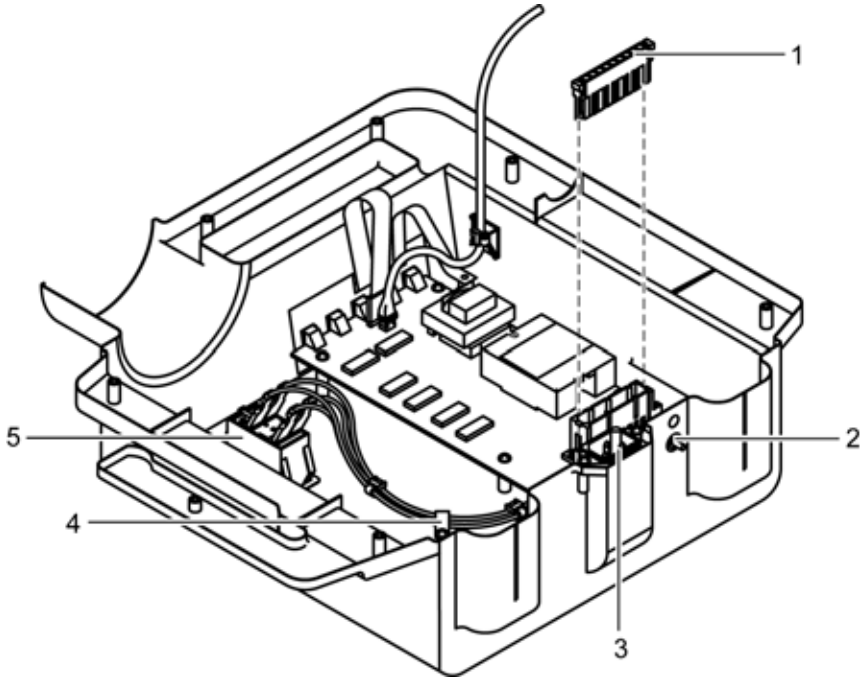


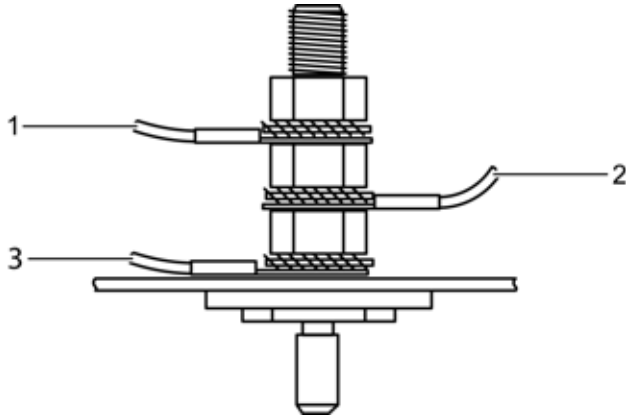
Figure 96: Front Cover Assembly

45. Install the tie-down around the four power switch wires. See Figure 96, item 4.

46. Install the AC power connector into the front cover assembly. The screws should be torqued to 4 in./lbs to 6 in./lbs (10 cm/kg to 15 cm/kg). See Figure 96, item 3.

47. Connect the 9-pin connector to the universal PCB. See Figure 96, item 1.

48. Connect the ground wires to the equipotential ground stud (Figure 96, item 2). The nuts should be torqued to 36 in./lbs to 44 in./lbs (91 cm/kg to 112 cm/kg). See Figure 97.



1 — Blower Housing Ground
2 — Blower Motor Ground
3 — AC Power Connector Ground

Figure 97: Equipotential Ground Stud Wiring

49. Install the cable harness cable tie-down. See Figure 98, items 1 and 2.

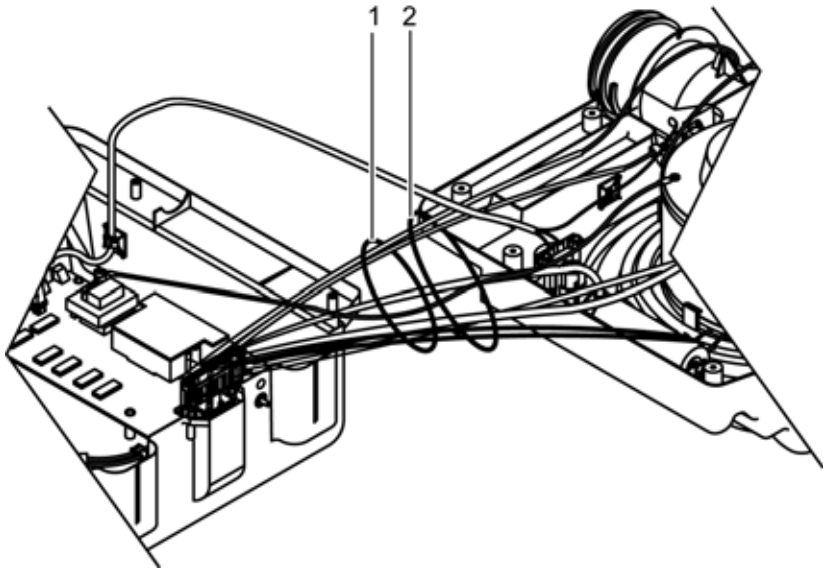


Figure 98: Cable Harness Cable Ties-downs

Caution: When placing the front and rear cover assemblies together ensure that the wires are not pinched between the covers.

50. Carefully place the front and rear cover assemblies together.

51. Install the seven screws into the rear cover assembly to attach it to the front cover assembly. The screws should be torqued to 7 in./lbs to 10 in./lbs (18 cm/kg to 25 cm/kg). See Figure 99.

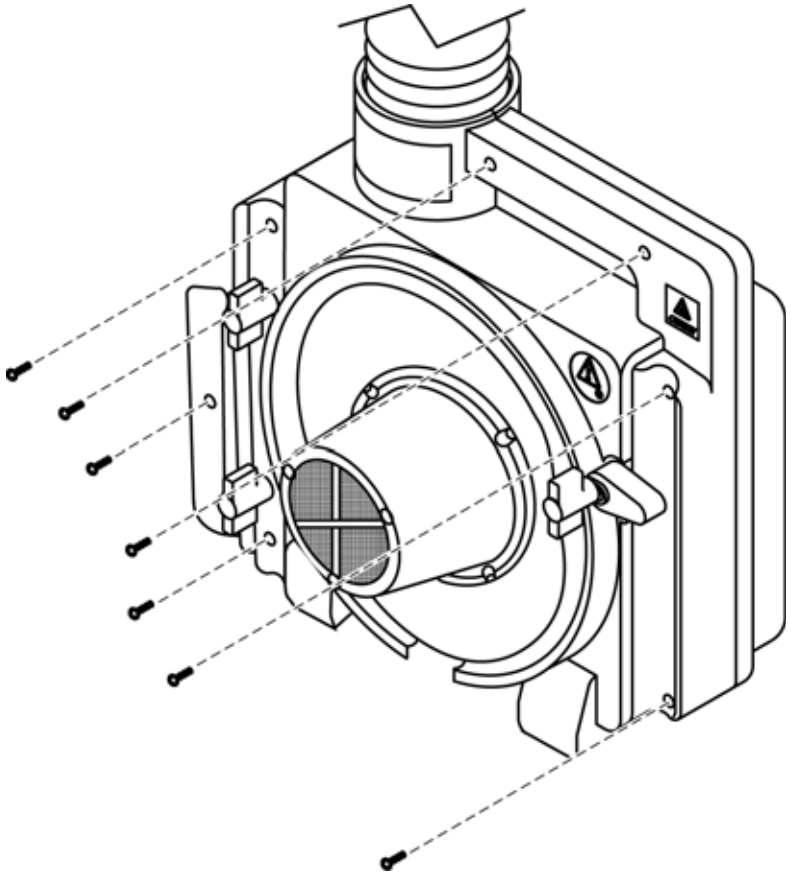


Figure 99: Cover Screw Locations

52. Place the filter assembly into the rear cover assembly. See Figure 100, item 1.

Figure 100: Filter Installation

53. Install the filter cover assembly on the rear cover assembly. The screws should be torqued to 8 in./lbs to 12 in./lbs (20 cm/kg to 30 cm/kg). See Figure 101.

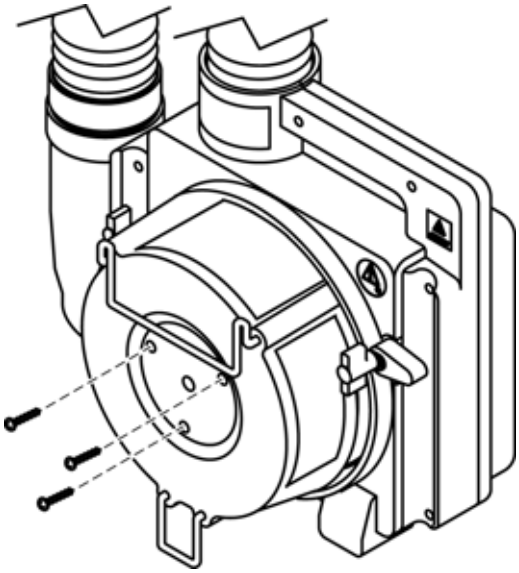


Figure 101: Filter Cover Installation

54. Attach the AC power cord to the warming unit.

55. Install the power cord retaining bracket (Figure 102, item 2), by tightening the bracket screws (item 1).

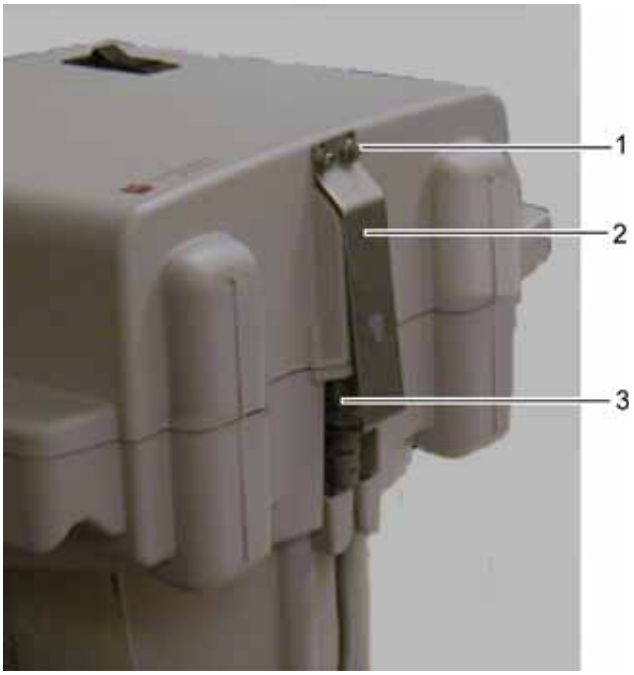


Figure 102: Power Cord Retaining Bracket

56. Perform the following checks/test to verify proper operation of the warming unit prior to returning the warming unit into service:

    - *Thermostat Protection Check* on page 17

- *Output Temperature Check* on page 20
- *Safety Tests* on page 22

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Ordering Information

The warming system and blankets may be ordered from Nellcor's Customer Services Department (1.800.635.5267, press 3) or your local Nellcor representative. See *WarmTouch Replacement Parts and Accessories* below for the Internet reference to part numbers for replacement parts and accessories.

Table 7: Replacement Parts and Accessories

Description	Part Number	Item Figure 103	Item Figure 104
Cart	502-2900	3	
Connector Assembly	168-1202SP		
Duct Adapter Assembly	168-0205SP		14
Filter Cover Assembly	168-0202SP12	8	
Front Cover Assembly	168-0201SP2	2	2
Fuse, 0.32 amps	169-5800		13
Heater Assembly	168-5203SP		15
Hepa Filter	502-2200	9	
Hose	502-2000	1	
I.V. Clamp and Foot	168-0203SP	4	
I.V. Clamp Knob	168-2005SP	5	
Nozzle	502-2100	13	
Nozzle Adapter, Augustine Medical BairHugger, Models 200, 250, and 500	502-1600		
Nozzle Strap, with Alligator Clip	312-0070	12	
Power Cord	502-2400	7	
Rear Cover Assembly	168-0200SP12	6	6
Shipping Carton	346-5849		
Strap, Velcro	168-2023	10	
Universal PCB	129-9011SP12		16

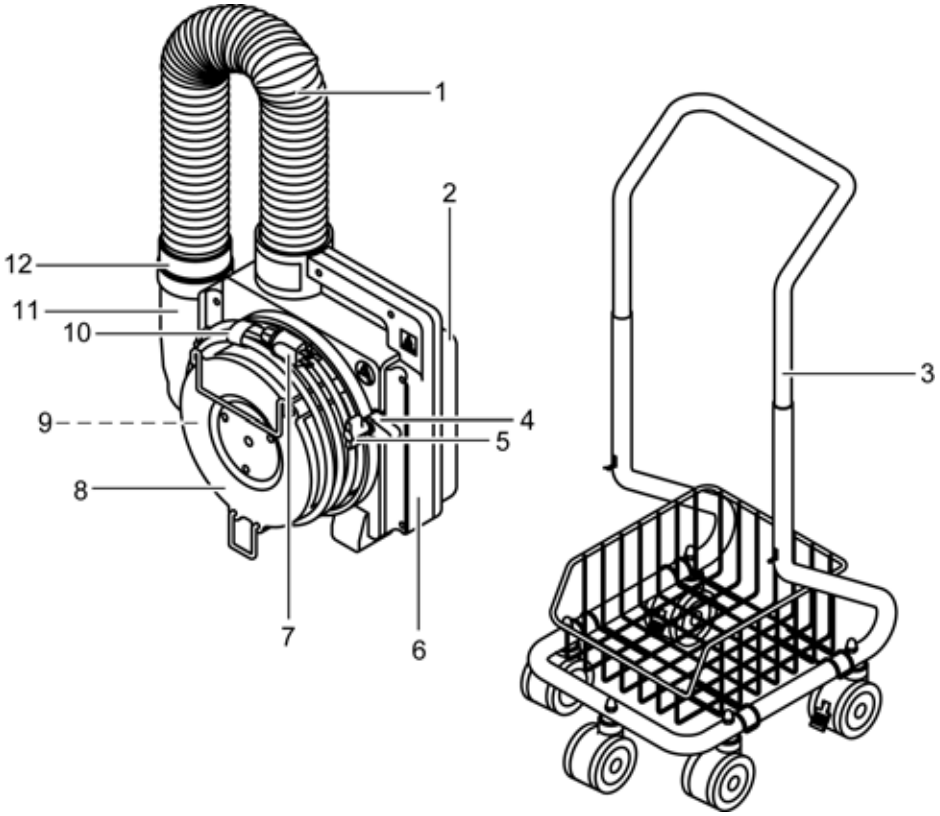

Figure 103: Spare Parts (Sheet 1)

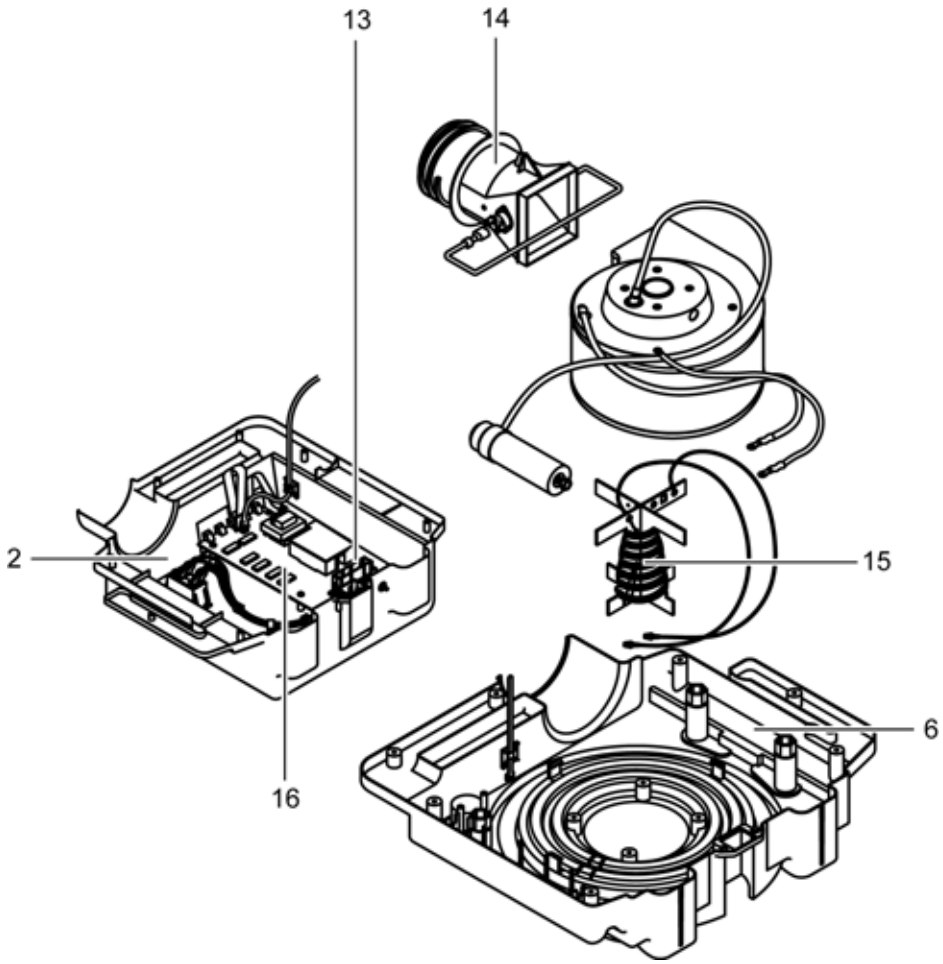

Figure 104: Spare Parts (Sheet 2)

WarmTouch Replacement Parts and Accessories

Warming system replacement parts and accessories are listed on the Internet at:

http://www.mallinckrodt.com/respiratory/resp/Serv_Supp/Apartweb/Main/PartAcceMenu.html

Manual Availability

The most recent revision of this manual is available on the Internet at:

http://www.mallinckrodt.com/respiratory/resp/serv_supp/productmanuals.html

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Introduction

To ship the monitor for any reason, follow the instructions in this section.

Returning the WT-5300

Contact Nellcor's Customer Services Department or your local Nellcor representative for shipping instructions, including a Returned Goods Authorization (RGA) number. Pack the WT-5300 in its original shipping carton. If the original carton is not available, use a suitable carton with appropriate packing material to protect it during shipping.

Return the WT-5300 by any shipping method that provides proof of delivery.

General Instructions

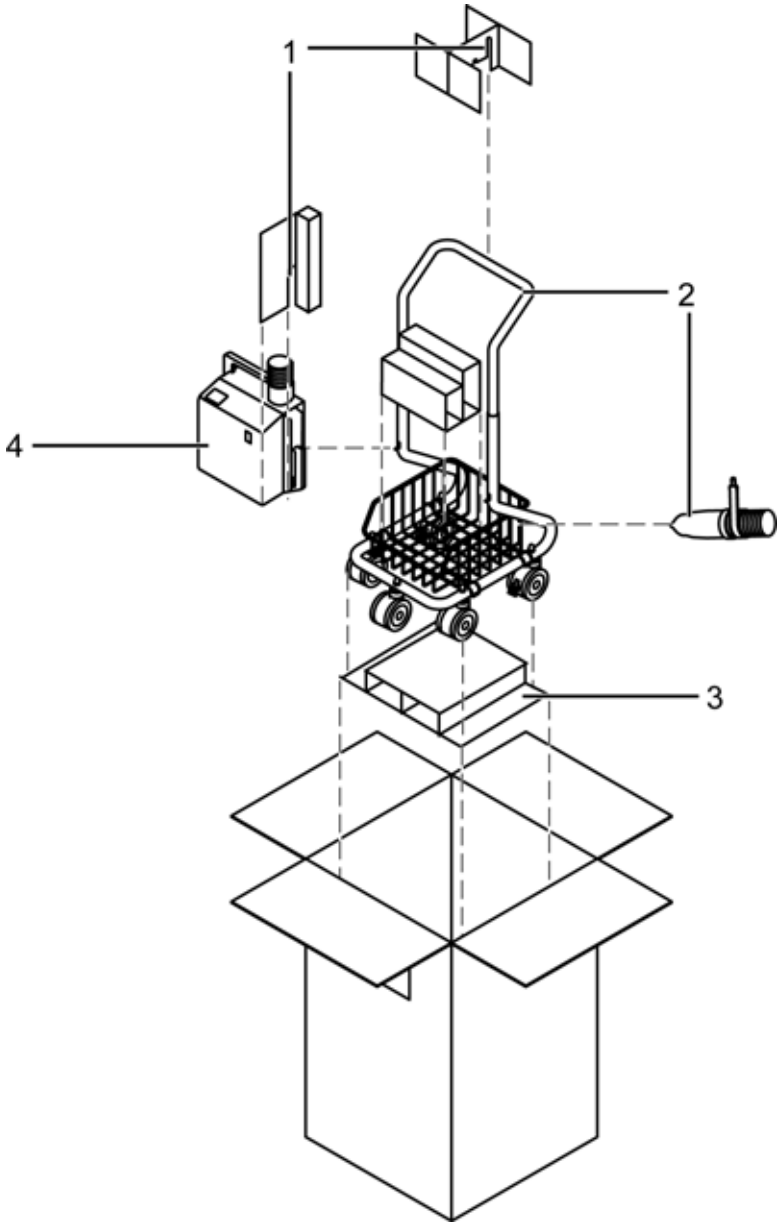
Pack the WT-5300 carefully. Failure to follow the instructions in this section may result in loss or damage not covered by any applicable Nellcor warranty. If the original shipping carton is not available, use another suitable carton; North American customers may call Nellcor's Customer Services Department to obtain a shipping carton.

Prior to shipping the WT-5300, contact your supplier or local Nellcor office (Customer Services Department) for a returned goods authorization number. Mark the shipping carton and any shipping documents with the returned goods authorization (RGA) number. Return the WT-5300 by any method that provides proof of delivery.

Repacking in Original Carton

If available, use the original carton and packing materials. See Figure 105. Pack the monitor as follows:

1. Place the WT-5300 in the original packaging.



1 — Place cut outs over cart handle and blower handle.

2 — Route nozzle and hose under cart handle and place nozzle behind insert in basket.

3 — Use ty-wrap to hold insert to cart while packing.

4 — Mount blower onto mounting pins on cart. Cart pins fit into lower blower case screw holes.

Notes:
1 — Cart handle must be in the fully down position.
2 — Tape or staples may be used on the inserts to ensure the insert retains it’s form.
3 — Ensure nozzle clip is placed away from basket and insert. Place as shown.

Figure 105: Packing

2. Seal carton with packing tape.

3. Label carton with shipping address, return address, and RGA number, if applicable.

Repacking in a Different Carton

If the original carton is not available, use the following procedure to pack the WT-5300:

1. Locate a corrugated cardboard shipping carton with a bursting strength of at least 200 pounds per square inch (psi).

2. Fill the bottom of the carton with at least 2 inches of packing material.

3. Place the WT-5300 on the layer of packing material and fill the box completely with packing material.

4. Seal the carton with packing tape.

5. Label the carton with the shipping address, return address, and RGA number, if applicable.

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Warming System Specifications

No special transport or storage methods are required for the warming system.

Table 8: Model WT-5300 Blower Specifications

Dimensions:	38 cm x 41 cm x 28 cm (15 inches x 16 inches x 11 inches)
Weight:	6.8 kg (15 lbs.)
Power Requirements	120 VAC, 50 - 60 Hz, 10 A
Automatic Temperature Stepdown (Boost to High Temperature)	After 45-minutes of continuous use.
Power Supply Cord:	4.26 m (14 feet)
Thermal Protection:	Thermostat (internal): 47 °C - 50 °C (117 °F - 122 °F)
Ambient Blower Operating Temperature Range:	18 °C - 30 °C (64 °F - 86 °F)
Protection Against Ingress of Fluids:	IEC 60601-1, sub-clause 44.6 for class IPX0
Protection Class:	1
Protection Type:	B

Table 9: Model WT-5300 Cart Specifications

Weight	4.6 kg (10.1 pounds)
Height with Handle Extended	87.6 cm (34.5 inches)
Height with Handle Retracted	70.5 cm (27.8 inches)
Width	31.8 cm (12.5 inches)
Depth	38.6 cm (15.2 inches)

Transport and Shipping in Shipping Container

Temperature	-40ºC to 70ºC (-40ºF to 158ºF)
Altitude	-390 m to 6,096 m (-1,280 ft. to 20,000 ft.)
Barometric Pressure	1,060 hPa to 500 hPa (375 mmHg to 795 mmHg)
Relative Humidity	15% to 95% (non-condensing)

Ground Integrity Test

100 milliohms or less

Earth Leakage Current Test

AC Polarity	Line Cord	Neutral Cord	Leakage Current
Normal	Closed	Closed	100 µA
Reversed	Closed	Closed	100 µA
Normal	Open	Closed	100 µA
Normal	Closed	Open	100 µA

Enclosure Leakage Current Test

AC Line Cord	Neutral Line Cord	Power Line Ground Cable	UL-544 and CSA 125	AAMI/ANSI Standard ES1
Closed	Closed	Closed	100 µA	100 µA
Closed	Closed	Open	100 µA	300 µA
Closed	Open	Closed	100 µA	300 µA
Open	Closed	Closed	100 µA	100 µA
Open	Open	Closed	100 µA	300 µA
Open	Closed	Open	100 µA	300 µA

Control Panel

The control panel features four manually switched temperature settings. The selected temperature is indicated by an LED indicator.

Figure 106: Control Panel

Each temperature setting represents the average temperature of air entering the blanket. The four temperature settings are:

- Low 32 °C (89.6 °F)
- Medium 38 °C (100.4 °F)
- High 43 °C (109.4 °F)
- Boost 45 °C (113 °F) for 45 minutes

There is a warning light on the control panel. See Figure 106. The warning light indicates that the warming system's safety thermostats have disabled the heater. The warming system will continue to blow air until the output temperature has decreased below the thermostat threshold temperature of 50 ºC. If there is no malfunction in the warming system, it should function normally. If the warning light illuminates again, the blower should be replaced and the faulty blower should be checked by qualified hospital personnel.

Main Circuit Board

See Figure 109 (at the end of this section) for the schematic diagram of the warming system main circuit board. The main circuit board consists of:

- DC Power Supply Circuit
- Control Logic Circuit
- Automatic Temperature Stepdown
- Temperature Control Circuit
- Liquid Crystal Display (LCD) Hour Meter

There are three connectors on the main circuit board:

- J1 – connects the main circuit board to the control panel
- J2 – connects the main circuit board to the AC power line circuit, the heater, and the blower
- J3 – connects the temperature control circuit of the main circuit board to:
  - YS1 400 series thermostat
  - Over-temperature test port

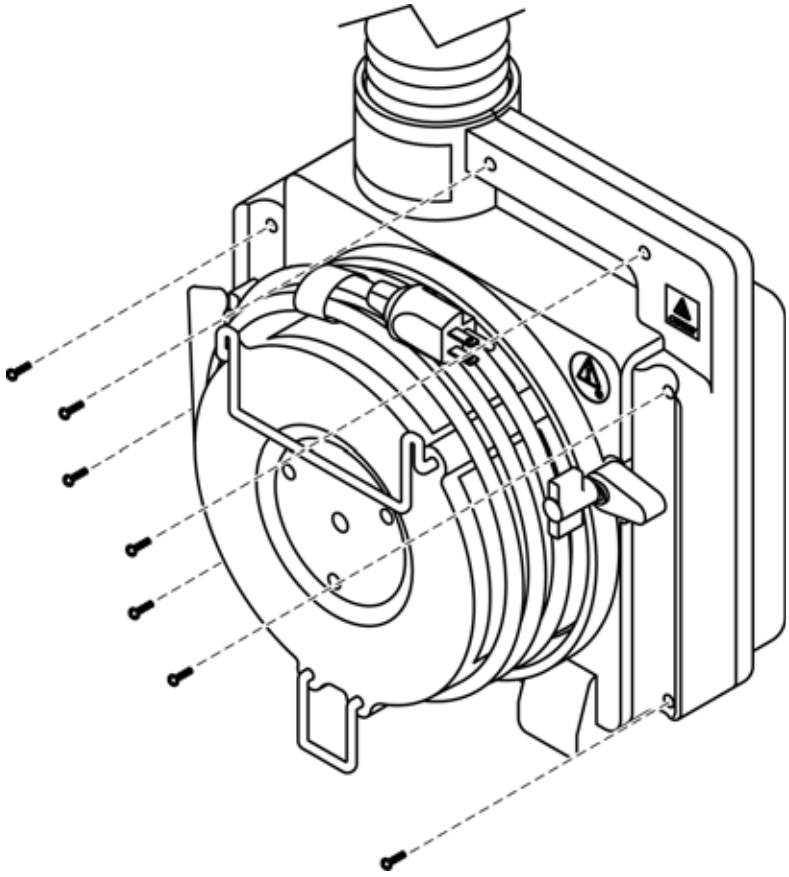
DC Power Supply Circuit

The 120 VAC enters the main circuit board through J2, pins 3 and 4. The power supply circuit consists of:

- F1 fuse, located in the primary of the transformer
- D7 bridge rectifier
- VR1 12 VDC voltage regulator

WARNING: Dangerous voltages (120 VAC) are exposed during this procedure. Exercise extreme care not to come in contact with the 120 VAC. Servicing is only to be done by qualified personnel.

In case of warming system unit failure (no lights), the presence of 12 VDC should be verified. This can be done by opening the warming system unit. See Figure 107. Connect a voltmeter to the test points 1 and 4 of J4 (test point J4-4 is ground and test point; J4-1 is 12 VDC). J4 is located on the circuit board assembly.



Seven Case Screws

Figure 107: Remove Screws to Open Case

Control Logic Circuit

The control logic circuit for temperature settings consists of:

- U1 and U2 logic gates
- U4 inverter
- U3 dual R-S latch

Automatic Temperature Stepdown

The temperature setting automatically lowers from boost to high after 45-minutes of continuous use. See Figure 109. This circuit consists of:

- U6
- Two gates of U4

Temperature Control Circuit

The temperature control circuit consists of:

- U7 comparator
- K1 relay (controls the heater)
- U8 optical isolator (which senses the status of the thermostats)

See *Output Temperature Check* procedure on page 20.

LCD Hour Meter

The warming system unit is equipped with an hour meter that is located on the front panel of the unit. The meter displays the number of hours the unit has been in use. See Figure 108.

1 — Operating Hours Meter

Figure 108: Hour Meter

AC Power Section

The warming system unit operates from a 120 VAC power source. Input power selection consists of a circuit breaker/rocker switch located on the front of the unit and a line filter/power cord receptacle located at the bottom of the unit. Power enters the main circuit board at J2, pins 3 and 4. The input voltage drives three major sections of the warming system:

- DC power supply
- heater
- blower

Blower

The blower is connected to the main circuit board through connector J2, pins 7 and 9.

Heater

The heater section consists of a heater element (1,000 Watts) and an over-temperature thermostat that will open if the blower fails to operate.

Thermostat Protection

There are two thermostats (A and B) located at the exit of the blower. Thermostats A and B are redundant systems and, if necessary, will automatically turn the heater off when the output temperature exceeds a set level. This condition lights the Warning light on the control panel. Refer to *Thermostat Protection Check* on page 17.

Over-Temperature Test Port

The over-temperature test port is located on the back panel of the warming system unit. The test port is used to verify the thermostat protection circuitry. Refer to *Thermostat Protection Check* on page 17.

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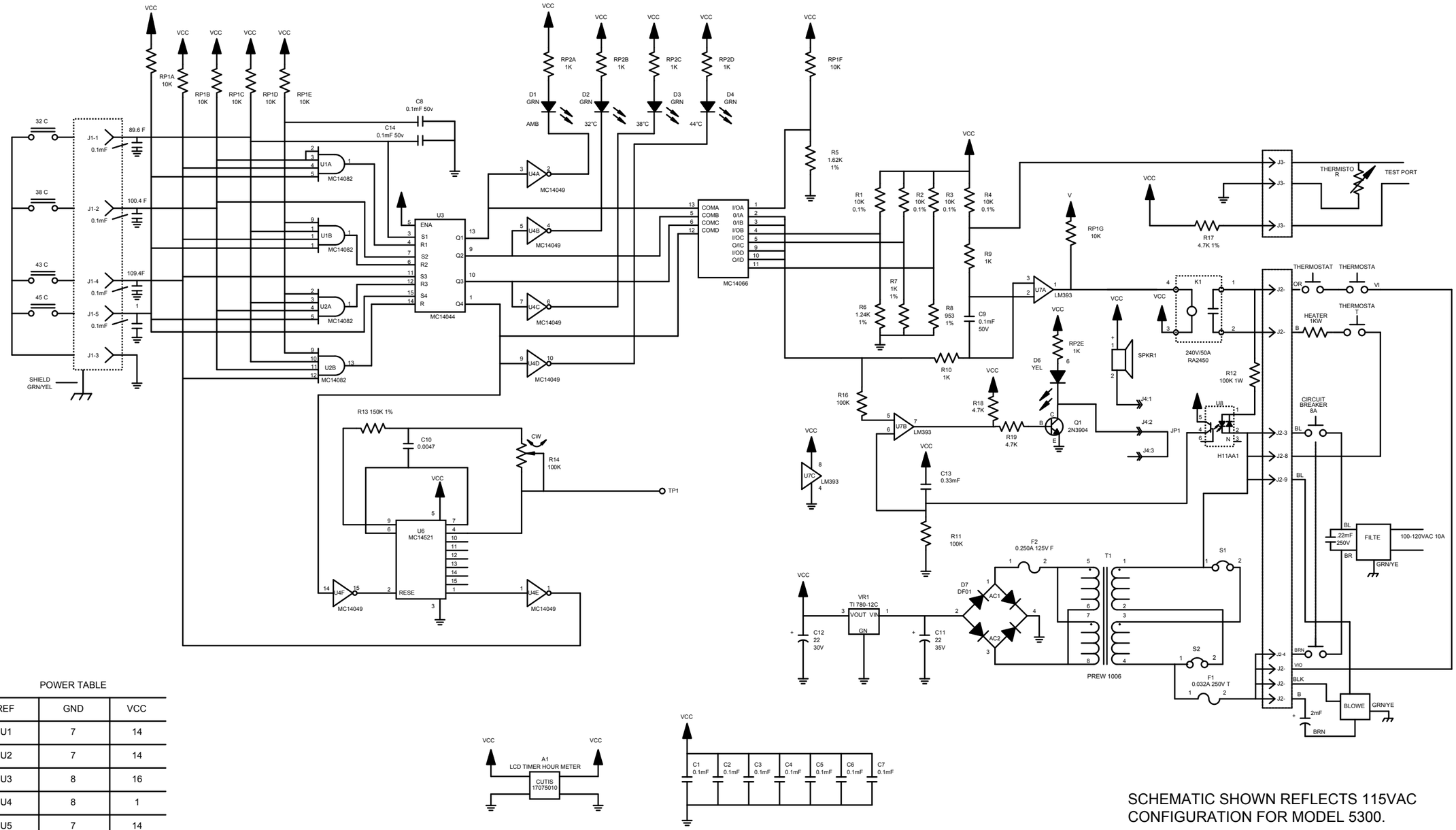

POWER TABLE

REF	GND	VCC
U1	7	14
U2	7	14
U3	8	16
U4	8	1
U5	7	14
U6	8	16
U7	4	8

NOTES:
1. ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
2. ASSOCIATE ONE DECOUPLING CAPACITOR PER EACH I.C.
3. REFER TO TABLE FOR VCC AND GND CONNECTIONS TO I.C.'S.

SCHEMATIC SHOWN REFLECTS 115VAC CONFIGURATION FOR MODEL 5300.

Figure 109
5300 Schematic Diagram

Index

A

AC power section 96
Accessories 83
Accessories web address 85
Automatic shutdown 4

B

Blower 97
Burn hazard 1

C

Cleaning 15
Control logic circuit 95
Control panel 93
Customized warming therapy 4

D

DC power supply circuit 94
Disassembly guide 23
Disinfecting 15
Duct adapter assembly replacement 61

E

Earth leakage current test 22
Electric shock 1
Electrical shock hazard 1
Enclosure leakage current test 22
Explosion hazard 1

F

Filter cover assembly replacement 23
Fire hazard 1
Front and rear covers, separating 25
Front cover assembly replacement 28

G

Ground integrity test 22
Ground stud 22

H

Heater 97
Heater assembly replacement 45
HEPA filter 11
HEPA filter replacement 9
Hose replacement 11
Hose retaining wire 13

I

Introduction 3

L

LCD hour meter 96

M

Main circuit board 94
MRI warning 2

N

Nozzle replacement 15

O

Operating hours meter 9
Ordering information 83
Output temperature check 20
Over-temperature test port 97

P

Packing for shipment 87
Patient burns 1
Performance verification 17
Possible explosion hazard 1
Possible patient injury 19
Power cord replacement 13
Power cord routing 14
Principles of operation 93

R

Rear cover assembly replacement 65
Repacking in a different carton 89
Repacking in original carton 87
Replacement parts web address 85
Returned goods authorization (RGA) number 87
Returning the WT-5300 87

Routine maintenance 9

S

Safety features 4
Safety information 1
Safety tests 22
Single patient use 2
Spare parts 83
Specifications 91
    earth leakage current 92
    enclosure leakage current 92
    ground integrity 92
Surface cleaning 15

T

Temperature control circuit 96
Thermostat protection 97
Thermostat protection check 17

U

Universal PCB replacement 37

W

Warning light 4
Warnings 1

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